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Perspective



Major General Kevin C. Kiley

My fellow members of the Army Medical Department Team:

I would like to take this opportunity to bring you up-to-date on an issue that has come to my attention. I was recently given a tour of the AMEDD Museum here at Fort Sam Houston. I was very impressed and pleased with the new exhibits and collections that are now on display. There is a wealth of fascinating artifacts that have been acquired from sources across the country. Some of my favorites include a freshly refurbished Korean War patient transport railroad car, a selection of captured German and Japanese field surgical sets from World War II and a prototype litter-carrying hovercraft from the Vietnam War era. These are but a few of the attention-getting displays covering the period from the Revolutionary War through the Vietnam years.

Because I had been the Commander of the 15th Evacuation Hospital during Operation Desert Storm, I was naturally interested in historical items on display that represented the Desert Shield/Desert Storm conflicts. I was surprised and disappointed when the curator explained that the Museum has been able to acquire very little in the way of post-Vietnam artifacts. This brings me to the point where I want to solicit your help. There is an increasingly prevalent perception that museums, in general, are only interested in display items from the "ancient" days...this is simply not the case. It turns out that most of the items offered to the Museum are from estates and from those people who donate later in life. While this is very much appreciated, it tends to create a shortage of items from the recent past. Some people might tend to think that the past two decades of Army medicine might not be as significant as the better-known conflicts of our parents' day; however, it is ALL a part of our heritage and is equally valuable. It is important that we obtain items from those whose recollections can help tell the story behind them...this is a big part of making displays more interesting and accurate.

I am, therefore, asking for your help in preserving not only our early AMEDD history but also that of our recent past. Any artifacts, pictures, uniforms, diaries, or collections you might have can be used to help tell the story of the AMEDD evolution and preserve our proud heritage. If you have artifacts or items from any post-Vietnam conflicts such as Grenada, El Salvador, Panama, Somalia, Haiti, Bosnia, Macedonia, or Kosovo, I ask that you seriously consider donating them to the AMEDD Museum to help with this worthwhile cause.

I feel it is important to do this as proud members of the United States Army. Our ***entire*** *past has made us what we are today-the finest medical force the world has ever known. We need to visually emphasize this fact at every opportunity; I think one of the best ways to inform the public as well as the rest of the U.S. Army is through the AMEDD Museum. Together, we can preserve our rich heritage for those who succeed us. If you are able to help with this project, contact Mr Scotty Knight, AMEDD Museum Curator, (210) 221-6358.*

Thank you for your support and for your continuing contributions to the Army Medical Department.

Moncrief Army Community Hospital



Putting Health Care Theory into Practice

Moncrief Army Community Hospital (MACH) is a 60-bed facility with the unique mission of supporting the health care needs of 38,000 initial entry training soldiers who begin their military careers at Fort Jackson each year, in addition to managing the care for an enrolled beneficiary population of over 25,000. I directed my staff to use creative, innovative thinking to review and analyze our internal operations to determine whether our current business processes are appropriate and enable us to not only survive, but also thrive in this challenging, resource-constrained environment. Therefore, using the theme "Putting Health Care Theory into Practice," the staff responded with a number of useful initiatives that are already beginning to creatively extend our constrained resources. These articles describe our efforts in four specific areas that will have a significant impact on our mission accomplishment. Captain Chris Moore, MS, has led the effort to extract data from our existing information systems and package it into a user-friendly format to educate and empower our providers. Captain Dan Stewart, MS, has led the effort to review the referral tracking system and suggest changes to improve management, moving from an aggregated focus to an individual patient focus. Lieutenant Colonel Lise Cote, MC, has led the effort to identify the highest users in our Family Health Clinic and our initial steps to use the "Primary Care Manager By Name" concept to improve the management of their care. Lieutenant Colonel Steve Braverman, MC, has led our initial attempts to develop a predictive model to determine the critical factors for successful outcomes with Physical Training Rehabilitation Program (PTRP) soldiers. The PTRP was designed to rehabilitate those highly motivated, quality soldiers who were injured during Basic Combat Training so that they can return to their units to finish their training. I am very proud of the multidisciplinary team effort that has enabled them to solve our problems in a supportive and collaborative manner. These are just a few of the programs underway at MACH, and are a testament to our desire to proactively find better ways of doing business.

Stephen G. Oswald
Colonel, MC
Commanding

The Provider Education Program

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Introduction

Health care continues to be a topic of great importance in the U.S. Concerns over health care can be narrowed down to three major headings: quality, access, and cost. Recipients of health care want high quality care, as often as they want it, and as inexpensively as possible.[1] While it may be possible to provide quality care in an easily accessible manner, it comes at a high price. This dilemma spawned the rise of the managed care model of health care delivery in the U.S. which attempts to balance quality, access, and cost in order to provide patients with a reliable standard of care at an affordable price. To support the Commander of Moncrief Army Community Hospital (MACH) in his quest to achieve this balance, we developed and executed this project studying productivity, data quality, compliance, and diagnosis patterns in the Family Health Clinic (FHC).

Purpose

The specific purpose of this project at MACH is to identify areas of data collection and coding compliance that are in need of improvement in the FHC and provide it with a reporting tool coupled with an education process to improve those areas. Additionally, the FHC will be used as a model for other MACH clinics to follow in instituting data quality improvements.

Background

As health care systems sought to balance quality, access, and cost, the transition towards managed care was a marked departure from the fee-for-service (FFS) model that previously dominated the health care industry. Managed care begins with a primary care manager (PCM) who provides the majority of care for their beneficiaries. The PCM functions as a "gatekeeper" in that a patient must receive a referral from the primary care provider before seeking care from a specialist if the patient wants the visit to be covered by his or her health plan. Additionally, some managed care models, such as a health maintenance organization (HMO), require formal enrollment to a specific PCM. Capitation is another major characteristic of managed care. In the capitation model, revenues are generated on a fixed (per member/per month) basis. If any funds remain after operating expenses and delivery of care has been provided, the provider keeps the remaining funds as a profit.[2]

The U.S. armed forces, like the civilian sector, witnessed increased use and rising medical costs in the late 1980s.[3] Between 1981 and 1987 annual costs growth rates approached 12% at medical treatment facilities (MTF).[3] Costs were also growing for the military health system's supplemental program, the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS). These rising costs, mixed with growing beneficiary dissatisfaction, led to the initiation of several demonstrations to test the feasibility of a managed care system of health care delivery in the Department of Defense (DOD).[4-6]

The CHAMPUS Reform Initiative was the first of

several demonstrations and the one that was developed into our current system known as TRICARE. TRICARE, representative of the three services (Army, Navy, and Air Force) of the DOD officially became the DODs health care plan in 1994. TRICARE was initially implemented in the northwestern portion of the U.S. and was phased across the U.S from 1995 to 1998. TRICARE is a triple-option plan that incorporates a three-tiered model of health care delivery options: Prime (HMO), Extra (PPO), and Standard (FFS). Like managed care in general, TRICARE has changed the approach of health care within the military from a retrospective-based to a more prospective-based method for care and the financing of that care. It has also impacted the overall approach to health care delivery.

The MACH is located on Fort Jackson, SC. The MACH falls within Region 3 of the TRICARE nation-wide system. The MACH is responsible for providing care to those service members permanently assigned to Fort Jackson, and their family members, eligible retirees, and service members temporarily assigned to Fort Jackson for Basic Combat Training, Advanced Individual Training, and service schools for enlisted soldiers and officers.

Like all MTFs in the DOD inventory, MACH is responsible for reporting data such as workload, encounters (diagnosis codes), and available work hours to the U.S. Army Medical Command (MEDCOM). Largely, the MEDCOM determines the staffing requirements and budget for AMEDD facilities like MACH. This puts the onus on the command team of MACH to provide accurate data, specifically in the areas of workload and acuity mix as reflected in diagnosis codes.

Literature Review

The changes associated with the implementation of TRICARE have caused MTFs throughout the DOD to look at their staffing, determine if the current practice works, and in many cases, change their current approach to a more efficient model of staffing and operations.[4,7] A review of the literature produced three references addressing changes to current practices following the switch to TRICARE. The first model dealt with staff mix issues while the other two dealt with process issues.[8-10] Notably, all three models used data in some capacity, either to benchmark standards, for analysis, or for review of records. Many of the authors mention the need for accurate data or convey that the available data were suspect and needed improvement.

Data are used in a variety of ways in managed care, from diagnosis codes, to billing, to defining beneficiary population's health requirements. Databases maintain information on the enrolled population and can be used to make staffing, budget, workload, and education decisions. The information gained from data, along with the other aspects of managed care, were supposed to help improve the access and quality of care, while reducing, or at least controlling, the cost growth of that care.

Unfortunately, managed care has been unable to achieve any of the primary goals of controlling health care costs, or of ensuring a set standard for quality of care or access to care.[11] A result of the growing concerns over costs and quality in the public sector was the increase in regulation on health care by state and federal authorities. Federal legislation is impacting on health care more than ever. Issues of over-billing and cost containment are at the forefront, followed by patient rights, medical errors, information issues, and TRICARE for life (Entitlement of Care). Stringent regulations for reimbursement have given rise to the need for accurate data and tools to capture and report data on patient care, billing, and practice costs.

Data, more specifically accurate data, have several beneficial implications for MTFs. Areas where data from the Medical Expense Performance Reporting System (MEPRS) alone are used include directed economic analyses, mail-order pharmacy use, facility sizing and construction studies, and provider compensation studies.[12,13] The MEPRS data are also seen at levels as high as DOD, Congress, and presidential committees.

Data are being used more frequently to develop performance measures and "scorecard" reports to assist health care leaders in their strategic planning and corporate decision making. Kaplan and Norton developed the "balanced scorecard" model that integrates financial and workload performance information to keep health care executives better informed on the state of their facilities.[14] Similarly, the Mayo Clinic outpatient operations leadership used data, produced in-house, to create a performance management and measurement system. This system links

the organization's vision, values, and core principles with daily operations and allows its leaders to gauge success on a weekly, monthly, or quarterly basis.[15]

The military health system (MHS) has also used data to develop performance measurement tools. The MEPRS uses expense, manpower, and workload data as the basis for regular financial and operating performance reports. The DOD, through the Data Quality Action Team, has also developed an MHS Data Quality Plan that includes a data quality metric survey. Metrics of this survey are designed to measure staffing levels, number of patient visits, and capture the number of incomplete Standard Ambulatory Data Records (SADR) in the Ambulatory Data System (ADS).[16]

However, data must be accurate. Kongstvedt describes some characteristics that are essential for useful data.[4] To be of value to a health care organization, data must have integrity, be consistent, and mean the same thing from provider to provider. Additionally, it must be valid, have meaningful measures, and must encompass an adequate time period. Data may come from multiple sources and, therefore, must be integrated into a common database.[4] Kongstvedt's explanation of data integrity describes data that are free from error or that have a minimal number of errors.[4]

Error-laden data, however, is a common issue in the healthcare industry. Coding errors effect data quality, hinder reimbursement efforts, and may lead to legal difficulties with the federal government for fraud. Many physicians and their staff fail to code to the highest level of specificity, citing fear of overcoding and lack of effort as the chief reasons for undercoding.[17]

The need for data, and more importantly accurate data, is a common theme throughout the literature. The MTF leadership must ensure that they focus on establishing and maintaining quality data integrity.[5,16] Hart and Connor echo that sentiment by contending that to make intelligent business decisions, relevant and valid data must be gathered and analyzed.[9]

Clearly the need for accurate data in the health care industry is a must. But how do you ensure accurate data and where do you get these data from? All too often the answer to this question has been to purchase a new information system to capture the desired data when the data may already be available in existing systems. But in the current period of shrinking budgets the focus is changing towards using available systems to get the needed information. Most health care organizations have plenty of technology in place, despite criticism to the contrary.[18] The challenge is knowing which system in the organization to get the data from, how to match it with data from other systems and then how to analyze the whole picture and effectively convey that to the facility's leadership. Getting the most out of existing systems will continue to be the norm as operating budgets continue to shrink.

The U.S. Army MEDCOM has many data systems. The Composite Health Care System (CHCS) is a hospital information system that is primarily used for inputting patient demographic information and booking patient appointments to providers in the various clinics of an MTF. The CHCS data are used to populate the workload portion (through the worldwide workload report) of the MHS-wide cost accounting system, the MEPRS. A third system used by MEDCOM is the ADS. The ADS collects data such as type of appointment, illness or injury, and diagnosis given to the patient for outpatient visits. The MEDCOM has mandated a 97% compliance rate for ADS. This means that a facility must record an encounter into ADS for each CHCS-completed visit 97% of the time or better. Encounters are recorded as individual SADR within ADS. This information can be used to analyze the encounter workload and acuity mix of those encounters for patients seeking care at MACH. If these health information systems are used properly, facilities in the MEDCOM could utilize the data from each system to make decisions. At the MTF level, the information provided could identify factors for potential health risks or epidemics within the served population. Unfortunately, many facilities in MEDCOM are burdened by poor data; therefore the leadership is reluctant to make decisions based on their internal data.

The FHC was selected as the subject for this case study because it is the largest MACH primary care clinic. As such, the FHC sees the majority of the permanent party patients that present to MACH. This fact makes FHC the most important clinic to the facility in terms of

implementing changes that will result in the largest improvements in data quality for MACH.

Methodology

The plan for this project is divided into three phases. **Phase I** consists of developing a baseline data period so that future data may be compared against this period to determine if the program is producing improvements. This baseline data is an average of compliance scores and other data from CHCS, ADS, and Patient Administration Systems and Biostatistics Activity (PASBA) from Jan to Jun 00. In an effort to utilize best practices identified in the literature, we are attempting to address several difficult issues in the operational environment. Similar to Curtright et al and Kaplan and Norton, information from these systems will be used to develop a one page "snapshot" for each provider assigned to the FHC, reflecting the following information:[14,15]

- The provider's ADS compliance for visits and telephone consults. The source for CHCS data is an ad-hoc provider workload report furnished by the MACH Resource Management Division. The PASBA in San Antonio provides the ADS data, which is initiated at MACH and processed through Fort Dietrick. These encounters are split into three categories. The first category is for count workload (generates relative value units [RVUs]). The second category is for telephone consult encounters (generates zero RVUs). The third category is for noncount workload (generates zero RVUs). For compliance statistics only the first category (count workload) is compared against CHCS count workload. A second calculation is performed for telephone consults in CHCS compared with telephone consults in ADS.

- The provider average RVU within the MACH FHC compared against all Family Practice Providers within TRICARE Region 3. The PASBA also provides this report. This is calculated at PASBA by conversion of the International Classification of Diseases, Ninth Edition, (ICD-9), Evaluation and Management, and Current Procedural Terminology data within each SADR found within the ADS, into an RVU (acuity adjustment).

- The provider's percent of total diagnoses, and the percentage of those diagnoses, that fall into the provider's Top Ten diagnoses are calculated each month. This is compared with the FHC's Top Ten diagnoses for the same month, and the percent of the provider's Top Ten diagnoses that fall into the FHC's Top Ten diagnoses for the same period. The ADS is the source for these data, from an ad hoc query performed by the Clinical Support Division personnel. These data are also assessed over several months to track possible trends.

- The provider's available clinic hours are compared with the average ADS clinic visits performed during a specific time period. The source for the available clinic hours is the Uniform Chart of Accounts for Personnel (UCAPERS). Normally a source for controversial information, UCAPERS data within the FHC has demonstrated enormous improvement during the months of Aug, Sep, and Oct 00. This is due to the outstanding efforts of the Health Care Administrator in the FHC.

Once the data are compiled for each provider, the Chief, FHC, is briefed on the status of FHC's coding accuracy. A sample of the "snapshot" report for FHC is furnished at Figure 1. Reference points, such as the Region RVU score, are provided to give the FHC an idea of how they measure up to comparable clinics in the region, and to allow individual providers in FHC to compare themselves with their peers. The intent behind this is to provide information to our providers on how their coding effects their RVUs. Phase I ended 30 Jun 00, upon the conversion of the FHC from the "bubble-sheet" ADS to KG-ADS. Phase I effectively provides the baseline data for this project.

Phase II was the transition from the old version of ADS (bubble sheets) to KG-ADS on 1 Jul 00. This period in the process caused improvements that were independent of the program. During this phase, Jul and Aug 00, MACH transitioned to KG-ADS, a paperless version of ADS that eliminates the need to scan encounter sheets to receive encounter credit and puts more control for coding back into the provider's hands. Because of this system improvement, data from the Phase II period is markedly better in some areas. However, during this time period the positive increases are due to the improved system (KG-ADS) and have nothing to do with any education or other management actions.

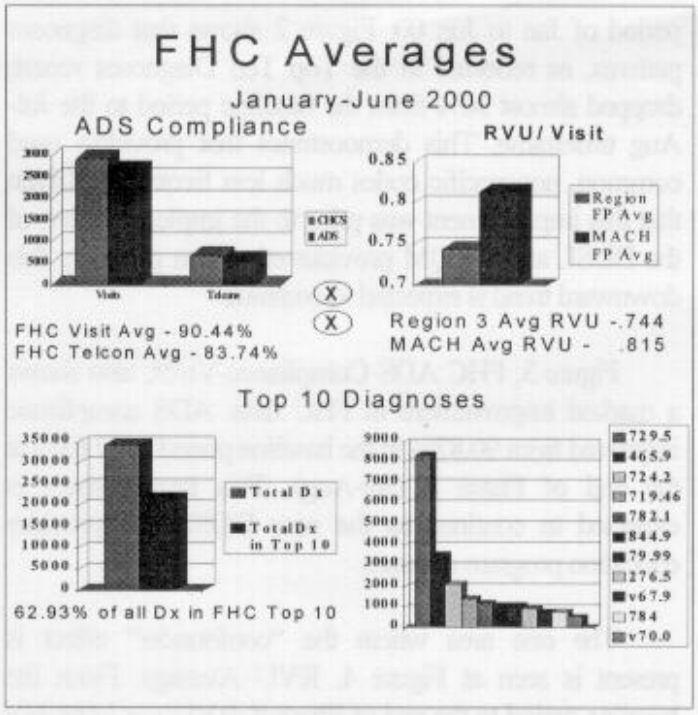


Fig 1.

Phase III is the education and surveillance period of the program, incorporating the recommendations for improvement. This period will last for 6 months and will track the changes of the aforementioned categories over that time. At the end of this phase, FHC should see significant improvements in data quality and compliance compared to data quality and compliance in Phase I.

The "snapshot" for Phase III will comprise a six-page report for each provider (one page per category) as opposed to the single page format. The report is expanded to six pages to show trends for each reported category over time. Figures 2 through 4 show the progress reports that track data for Top 10 Diagnoses (Figure 2), ADS compliance for visits (Figure 3; a similar report, though not provided, tracks ADS compliance for telephone consults), and RVU data (Figure 4) respectively. Additionally, a pharmacy information page has been added (See Figure 5) that relates actual CHCS-derived pharmacy costs compared with individual provider ADS-generated encounters (visits) and acuity adjusted visits (Individual Provider average RVUs). The pharmacy data are derived from the CHCS data on provider entered prescriptions that are married up with true costs. This is a standard report within CHCS at MACH.

In addition to the "snapshot" report, a representative from the Department of Quality Management (QM) will work with the Chief, FHC, to provide an education program on accurate coding to the FHC providers. Additionally, the QM representative and the Chief, FHC, will work together to develop a more concise drop down selection list (DDSL) on KG-ADS for the providers to choose a diagnosis code that more accurately reflects the incident of care. This DDL will be designed to facilitate more accurate coding of patient visits and reduce the overuse of general diagnosis codes such as "General

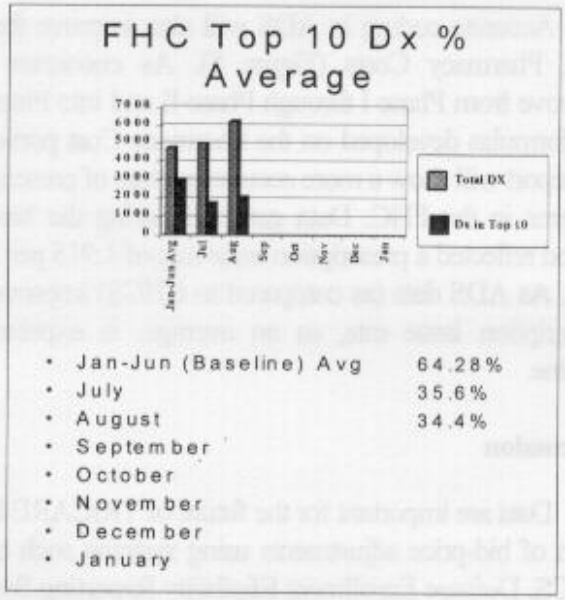


Fig 2.

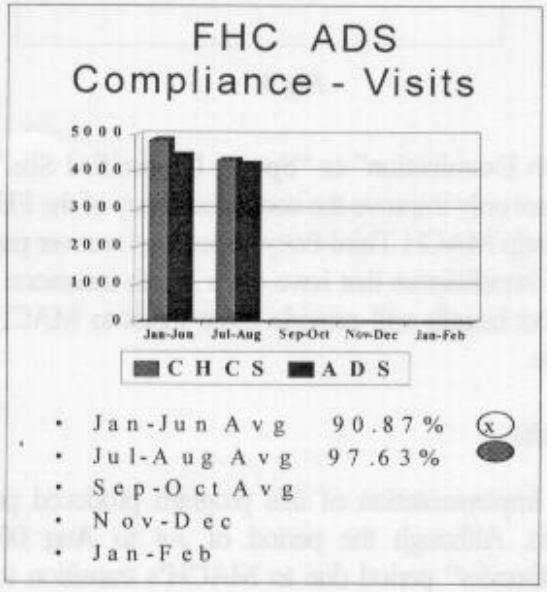


Fig 3.

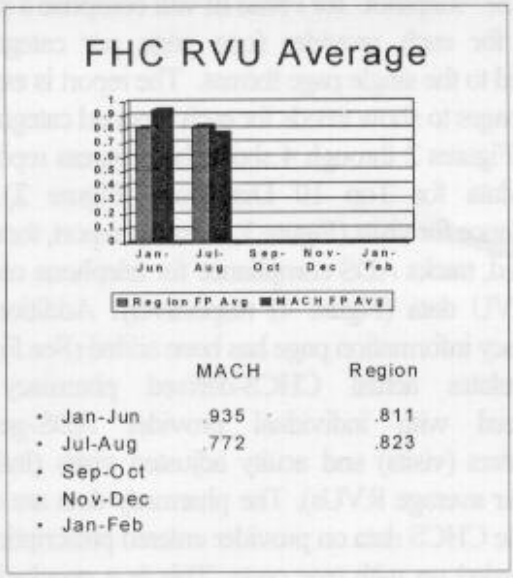


Fig 4.

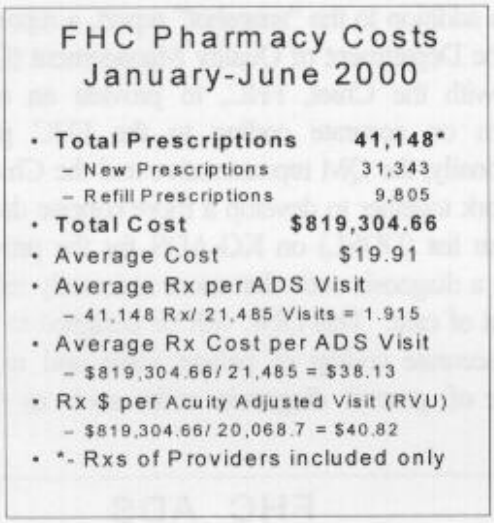


Fig 5.

Health Examination" or "Sprain, Unspecified Site." This will not only improve the coding accuracy of the FHC but will help MACH Third Party collections recover payment from beneficiaries that have other health insurance. This indirect benefit will provide more funds to MACH as a whole.

Results

Implementation of this program produced positive results. Although the period of Jul to Aug 00 is a "confounder" period due to MACH's transition to KG-ADS, data were markedly better than during the baseline period of Jan to Jun 00. Figure 2 shows that diagnoses patterns, as reflected in the Top Ten Diagnoses report, dropped almost 30% from the baseline period to the Jul-Aug timeframe. This demonstrates that providers used common, nonspecific codes much less frequently. Given that this improvement was prior to the implementation of the DDSL and the QM provider education program, this downward trend is expected to continue.

Figure 3, FHC ADS Compliance-Visits, also shows a marked improvement in FHC data. ADS compliance improved from 90.87% in the baseline period to 97.63% at the end of Phase II (Jul-Aug). This improvement is expected to continue as the new DDSL and provider education program matures.

The one area where the "confounder" effect is present is seen at Figure 4, RVU Average. From the baseline period to the end of Phase II, RVU's at MACH's FHC actually declined from .935 to .772, as compared to a Region 3 improvement from .811 to .823 during the same time frame. One possible explanation for this occurrence is the fact that the FHC has a large influx in school age children visits for health examinations prior to starting school. This generic examination generates a low RVU weight and could have reduced the cumulative RVU score for the clinic. As data improve in the areas of ADS and diagnosis patterns, we anticipate that the RVU scores will start an upward tread.

Accurate coding in ADS will also improve the last area, Pharmacy Costs (Figure 5). As encounter data improve from Phase I through Phase II and into Phase III, the formulas developed on the Pharmacy Cost portion of the report will show a more accurate picture of prescription patterns in the FHC. Data gathered during the baseline period reflected a prescription issue rate of 1.915 per ADS visit. As ADS data (as compared to CHCS) improve, the prescription issue rate, as an average, is expected to decline.

Discussion

Data are important for the future of TRICARE in the form of bid-price adjustments using systems such as the CHCS, Defense Enrollment Eligibility Reporting System, and Defense Medical Information System. Data are

collected in these systems at various points during the life of a TRICARE contract to determine if the managed care support contractor in a particular region is entitled to more money based on workload performed at the MTFs within each region. In this case, accurate data are necessary to prevent DOD from spending money inappropriately.

This project is providing both direct and indirect improvements to the data quality, compliance, diagnosis patterns, and pharmacy cost per visit of the MACH FHC. Direct results include the buy-in of the FHC department chief. This has led to the partnering of clinical and administrative personnel, all focused on improving data quality and accuracy within the FHC. Other benefits are tied to the program's development. Providers are beginning to see their individual "snapshot" report on a regular basis so they can gauge their own performance for the previous period. They are also being provided with a trend report to track their improvement over time or identify areas that need improvement. It is important to note that individual providers will only receive byname information on themselves.

As coding into KG-ADS improves, other areas analyzed by the program should improve as well. The average RVU should improve as a result of better coding because more specific diagnoses are given more weight than less specific codes. The Top Ten diagnoses portion will also improve, as seen by a decrease in the percentage of diagnoses in the Top Ten for individual providers and FHC as a whole. This move towards more specific and accurate coding of individual illness and disease processes may give a better indication of the broader spectrum of care being provided at the FHC.

Another indirect benefit of the program is the restructuring of scheduling templates by the FHC administrator. The clinic administrator attended the initial briefings on this program and took notice of the available hours and the average visits per day of the FHC providers. Since then, the clinic administrator has started to analyze the man-hour reports to ensure more accurate reporting of available hours for the FHC.

As mentioned earlier, this program can also be used to track provider and clinic information. This should allow the coding to better reflect the excellent care already being provided. Additionally, since the "snapshot" and trending reports use data common to most clinics, these reports can be used throughout the organization with little modification other than changing the name of the clinic and provider. Both reports were designed using Microsoft Excel and PowerPoint, which will allow administrators and clinic chiefs to easily manipulate these reports and quickly enter changes at the end of each period. Further, this program could be adopted by other facilities in Region 3 and eventually MEDCOM.

The ability for a clinic or department chief to monitor improvement helps the commander look for new ways to implement incentive plans for MTF providers. Commanders wanting to tie incentives to data quality and productivity would find this tool useful. It allows them to track the progress of the providers and see where they rank among all providers in their respective clinic. Some possible approaches to compensation issues include linking compensation to individual and overall network performance using criteria such as volume (encounters and visits) to determine incentives.[19,20] In this case, data systems are used to track the number of visits to each provider which is later used to determine the amount of incentive pay the provider is entitled to according to his or her contract.[19]

The last area of utility is that of prevention. Once the data are improved to the point that they can be considered reliable and valid, the results could be used to identify potential trends in the served community. This would enable the medical system to take appropriate steps to improve the overall health and wellness of the beneficiary population.

Conclusion

Data have indirect implications in the areas of provider productivity, compensation, and improvements to the TRICARE contracts in the future. Data can be used to analyze productivity among providers in the same department and to benchmark productivity in the clinic as a whole. Improvements in data quality for the FHC will provide the MACH leadership with a much better picture of the quality of coding, the number of visits each provider sees on a monthly basis, and what type of illness or injuries typically present at the FHC. This will facilitate decision

making in the areas of staffing levels and staff mix, and allow the leadership to implement wellness and preventive medicine programs to promote healthier beneficiaries.

References

1. Griffith J. Championship management for healthcare organizations. *J Health Care Mgt.* 2000;45(1):17-31.

2. Kovner A. *Health Care Delivery in the U.S.* 5th ed. New York, NY: Springer Publishing; 1996.

3. Zwanziger J, Kravitz R, et al. Providing managed care options for a large population: Evaluating the CHAMPUS Reform Initiative. *Mil Med.* 2000;165:403-410.

4. Kongstvedt P. *Essentials of Managed Health Care.* 2nd ed. Gaithersburg, MD: Aspen Publication; 1997.

5. Campbell K. Enrollment Based Capitation: Its use in the MHS. *AMEDD J.* 1998;46-51.

6. Goodman R. The evolution of managed care within the MHS. *AMEDD J.* 2000;54-59.

7. McGee W, Hudak R. Reengineering Medical Treatment Facilities for TRICARE: The Medical Group Practice Model. *Mil Med.* 1995;160:235-239.

8. LaMar J, et al. Provider Workforce Model for Regional TRICARE Networks. *Mil Med.* 1997;162 590-596.

9. Hart S, Connors R. Resourcing Decision Model for Military Hospitals. *Mil Med.* 1996;161:552-556.

10. McGraw E, Barthel H, Arrington M. A model for demand management in a managed care environment. *Mil Med.* 2000;165:05-308.

11. Holm C. Physician-Health System Partnerships: Optimal Strategies for Health Systems and Physician Practices with Limited Financial Resources. *J Healt Care Mgt.* 2000;45(5):286-289.

12. Medical Expense and Performance Reporting System Information Page. Available: www.meprs.amedd.army.mil/meprs.html.

13. Dolter K. Outcomes Management: an Imperative for the MHS. 2000.

14. Kaplan R, Norton D. Putting the Balanced Scorecard to Work. *Harvard Business Review.* 1993;134-147.

15. Curtright J, Stolp-Smith S, Edell E. Strategic Performance Management: Development of a Performance Measurement System at the Mayo Clinic. *J Health Care Mgt.* 1999;45(1):58-68.

16. MHS Data Quality Plan. Available: www.ceis.ha.osd.mil/library/docs/docs.hm.

17. Finger A. The biggest coding blunders. *Med Economics.* August 21, 2000;126-142.

18. Morrissey J. Maximizing unused power: Hospitals save millions by extracting more out of information systems already in place. *Modern Health Care.* August 14, 2000:50-56.

19. Holm C, Lipsky M. Using compensation to improve primary care. *MGM J.* July/August 1999:20-26.

20. Kaplan R, Norton D. Using the Balanced Scorecard as a Strategic Management System. *Harvard Business Review.* 1996;75-88.

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Identifying Control Measures and the Referral Tracking Process

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To provide the Moncrief Army Community Hospital (MACH) command team recommendations to improve the referral tracking and management process, the researchers reviewed current referral management literature and conducted an analysis of the existing referral tracking system. This was outlined through data flow diagrams with narrative descriptions and then compared against the optimal elements of referral tracking management found in the literature. Recommendations include tracking referrals on an individual basis, consolidating the processing of all referrals into a central database, and improving the effectiveness and usefulness of the databases used in tracking referrals. These recommendations were accepted and implemented in the Sep 00 timeframe. While the initial results are encouraging, it is still too early to declare objectively that the changes have created a significant business process improvement. However, the major intent of this article is to outline the process used in identifying the strengths and weaknesses of the referral tracking system and how those areas could be improved.

Background

The staff at MACH, Fort Jackson, SC, has proactively reviewed its referral tracking process. By improving the process, the MACH leadership hopes to optimize its services and patient outcomes, improve compliance with regulatory and accrediting standards, and prepare for future funding methodologies or new Managed Care Support Contracts (MCSC), such as Revised Financing. In the managed care environment that the Military Health System (MHS) operates, the tracking of referrals and consultations represents an important issue for the MHS in resource utilization, patient access, and quality of care.

In response to the perceived failure of fee-for-service health care financing, we have seen the implementation of managed care.[1] According to Shultz and Young, managed care is a direct relationship and interdependence between the provision of, and payment for, health care.[2] While managed care plans are concerned with providing quality and accessible care, the fundamental function of managed care is to control the utilization of services.[3] Rather than financing all desired care, managed care attempts to lower costs by optimizing care to those with valid medical need and educating the patient to meet some of their "wants" with self-care as appropriate.

Central to understanding managed care is an understanding of managed care's population orientation and the organization of provider networks that take responsibility for this population.[2] The managed care model designed to provide the strictest cost and resource control is a Health Maintenance Organization (HMO). The HMO combines the health insurance functions with the health care delivery system in an effort to provide care in the most appropriate and least expensive setting.[4] To do this, the HMO uses a primary care manager (PCM) who may be a primary care physician, physician's assistant, or nurse practitioner to manage the care of individual patients. The PCM serves as the conduit for the health care system providing basic primary medical intervention,

inter-group referral, or authorizing required referrals to appropriate specialists. By managing the resources used in the treatment of patients and in particular by preventing unnecessary diagnostic procedures and referrals, the HMO attempts to increase access and quality while reducing the cost to those financing the care.

As a large provider of health care benefits, the Department of Defense (DOD) has experienced many of the same challenges as the civilian health care industry. In response to rising costs and issues of access and quality, the DOD has initiated TRICARE, its own managed care program. TRICARE serves active duty military members, retirees, and eligible family members.[5] The program offers nonactive duty beneficiaries three options for receiving health care: Standard, Extra, and Prime. TRICARE Prime is an HMO type plan that requires beneficiaries to enroll with the local military treatment facility (MTF) or a participating civilian organization. Normally, active duty members are automatically enrolled into TRICARE Prime and are assigned a PCM at the MTF and do not have the option of choosing specialists without approval of their PCM. TRICARE Prime allows nonactive duty beneficiaries to choose a PCM from a DOD organization or from a list of participating civilian PCMs. These PCMs are responsible for all treatment of Prime beneficiaries. As an option for treatment, PCMs may refer their TRICARE Prime patients to specialists for further intervention or consultation.

Literature Review

According to The Managed Health Care Dictionary, referrals and consultations are requests for additional care or medical information by a provider on behalf of a patient.[6] Every physician, regardless of specialty, turns to another physician for advice at one time or another.[7] This useful practice of referral and consultation becomes formalized as physicians specialize during their training and limit their practice to a particular type of medicine. Referrals are a transfer of responsibility, temporary or permanent, for a patient's care from one physician to another.[8] This is different from a consultation, which is a formal request for advice. Although the lines between these two requests are often blurred, the referral transfers responsibility and a consultation does not.[9]

The Referral Process.

A typical referral process has five steps. First, the referring provider and patient determine the need for consultation. Second, the referring provider communicates the reason and appropriate clinical information regarding the patient to the specialist provider. Third, the specialist evaluates the patient. Next, the specialist communicates all findings and recommendations to the referring physician. Finally, the patient, referring provider, and specialist determine whether (or what) further treatment is needed.[10]

Historically, the decision to refer a patient was based upon quality of care concerns or patient preferences, and providers paid little attention to cost effectiveness.[11] A recent study attempted to determine what medical and nonmedical factors influenced referrals from generalists to specialists. Their 5 month prospective survey found only 20% of referrals were influenced by purely medical reasons, another 3% by only nonmedical reasons, and that 76% of all referrals were influenced by both medical and nonmedical factors. Some of the top medical reasons cited in the study included getting advice about a therapy, obtaining assistance with making a diagnosis, confirming a diagnosis, performing a diagnostic or therapeutic procedure, and learning more about treatment options. Nonmedical reasons included meeting the community standard of care, acceding to the patient's request for referral, learning how to deal with similar cases in the future, obtaining assistance with patient education, and reassuring the patient or the patient's family that a serious disease was not present.[12]

Dononhoe et al also found that a wide amount of variation exists in generalists' referral rates.[12] In fact, according to Rankel, less than 5% of all primary care visits result in referral.[7] However, this small percentage is still significant as one study found that the average referral generated about $3,000 in hospital charges and professional fees.[13] With the current dominance of managed care, cost containment has become an important concern in this process. Despite the small percentage of PCM referrals, each becomes expensive. Furthermore, because great variation exists among providers, each hospital may have several PCMs that refer more frequently, reinforcing the need to monitor, control, and educate.[14]

The Analysis of Referrals.

Through prospective review of nonurgent consultation requests, were able to reduce the referral rate from 4.3% to 3.2% over a 22-month period.[15] Donohoe, et al surveyed generalists and specialists over a 5-month period and found that nearly one third of all referrals were inappropriate.[12] The physicians in the study also identified nine factors that could have reduced referrals. These included more training in specific procedures, consultation with a trusted colleague, telephone consults with a specialist, the presence of a health educator, availability of clinical practice guidelines, longer visit lengths, computerized medical expert systems, MEDLINE search capabilities, and subspecialty texts.

Although these studies imply that physicians who make inappropriate referrals may require additional training or support to reduce this behavior, not all researchers agree. Fertig et al found that high variation in referral rates was not explained by inappropriate referrals.[16] They concluded that application of referral guidelines would not be useful in reducing the number of referrals to hospitals. Reynolds et al shared similar findings.[17] They determined that a high rate of referrals does not necessarily imply a high level of inappropriateness.

In addition to studies conducted to reduce total referrals, researchers have also looked into the efficiency of the referral process. Some of these studies cite communication between the referring provider and the consultant as the least efficient part of the referral process.[9-10,18-19] Two of these studies urge referring physicians to better coordinate care by providing more detailed written and telephonic information to consultants.[10,18] Curry et al found that using something as simple as a return mailer increased consultant feedback from 39% to 60%.[8] Finally, Kinnersley et al found that in-house referrals with another PCM often prevented questionable referrals and led to more satisfied patients.[20] Their study found that 38% of referrals to specialists were avoided through consultation with another PCM.

Other studies suggest that some inefficiency is a result of the patient's action or inaction.[21-22] These studies suggest that patients frequently miss their referral. In a 4-month study of patients visiting a general pediatric office, Jones et al found that less than half the patients actually appeared for subsequent referral appointments.[22] Addressing this issue found the rate of "lost patients" declined when he provided a single specialist for consultation rather than a list of names.[23]

Managing Referrals.

Since referrals can have such a large financial impact on managed care budgets, the referral process is a prime target for utilization control.[14] Targeting these referrals, however, requires that managed care organizations capture utilization and cost data in an accurate and timely manner. Once organizations accurately capture their cost and referral data, they can monitor themselves against these numbers and implement appropriate control measures. For managed care organizations, pursuing utilization control then becomes a choice of employing either basic or tight methods of referral management.[3]

The two most basic methods of referral control are a PCM authorization system and selecting providers on the basis of a demonstrated pattern of practice. Kongstvedt contends that a PCM-controlled authorization system is an essential element in managing referrals and consultant costs.[3] Without a PCM authorization system, managers have a markedly diminished chance of effectively controlling referral utilization. The other basic method to reduce referral expense is to select providers on a demonstrated pattern of practice basis. Those providers who tend to refer without authorization or perform procedures not requested or authorized should be excluded from referral decisions.[3] When responsibility for the patient is lost between the referring provider and the consultant, inappropriate decisions and even duplicate tests or procedures may result.[7]

Some common methods are used to achieve tight control of the referral process. These methods include authorizations for single visits only, prohibition of secondary referrals and authorizations, review of reasons for referral, limitations on self referral, standards for referral forms, and use of case managers for more complicated patients. Single visit authorizations give managed care organizations optimal control of referrals. Under this system, when a PCM makes a referral, he or she provides authorization for a unique episode of care.

The authorization is good for one visit only and can be used for only one claim. Exceptions to the single visit rule could include chemotherapy, obstetrics, and mental health, but ultimately should be decided by the plan.[3]

A second method for achieving tight control involves the prohibition of secondary referrals to prevent consultants from authorizing additional specialist visits. If a consultant wishes to refer the patient to another provider, he or she must provide that information back to the PCM, who is the authorization authority. This is intended to prevent unnecessary or even duplicate referrals.[3]

A third method used to tighten referral control is to have the medical director prospectively review all referrals. In reviewing the reasons for referral, the medical director or his representative should look for specific standards. At a minimum, the referring PCM should indicate why the patient is being referred, what the PCM thinks the diagnosis is and/or what he is concerned about, what has already been done, and what exactly the PCM wants the consultant to do. Further, the PCM should indicate the results of his own work-up and/or significant findings in the patient's history and physical examination thus making the consultant's job easier and more efficient.[3]

Another method for increasing the efficiency of the referral process is the employment of a case manager. A case manager is a specialist who manages the provision of services for members with high cost medical conditions and who receive care across multiple practice settings.[3] By involving these specialists in the treatment of patients who have chronic and/or high cost problems beyond the expertise of their PCM, costly episodes can be more efficiently and effectively managed.

Finally, to achieve tight control, managed care plans should limit their members' ability to self-refer to consultants. Many plans deny payment for such unauthorized referrals. However, some managed care plans offer a point-of-service option that allow members access to specialists without PCM authorization, but at a significant cost to the member.

Referral Tracking.

A review of published literature produced very little research directly related to referral tracking systems. However, one unpublished study by Edwards explored the consult management process at a DOD medical center.[24] The medical center in this study was perceived as a "black-hole" for referrals. Providers from local DOD hospitals felt that once referrals were sent to the medical center, very little information was ever returned. The medical center leadership was therefore concerned about losing consultations. Edwards investigated the issue by performing a systematic analysis of the referral process, conducting a review of the literature, interviewing the staff of the facility, and working with a team of functional area experts to develop a workable process. Based on his research, Edwards recommended: (1) increasing education for PCMs on their roles and responsibilities to treat specialty cases; (2) using computer technology to improve consult returns; (3) implementing a utilization management program; and (4) reorganization of the consult management office to increase the amount of information sent back to referring physicians.[24]

Purpose

The MACH Commander directed that the focus of the referral tracking project enable the leadership team to achieve several major objectives. His focus was on developing objectives that were definable, achievable, and measurable. These goals were to optimize services and patient outcomes, improve regulatory and accreditation compliance, and prepare for future financing methodologies.

***Goal 1**: Optimize Services and Patient Outcomes.*

The MACH hopes to optimize services by using its specialists to their fullest capacity. This will preclude using civilian specialists for care that the staff at MACH could provide at less cost. In addition, MACH will support the current DOD initiative of MHS Optimization. The primary intent of this plan is to determine what the requirements are to ensure best practices of health services delivery and to utilize available resources to maximize internal operations.[25] Further, improved referral tracking supports current initiatives and trends such as outcome measurement, evidenced-based medicine, and effective utilization of resources.

***Goal 2**: Improve Regulatory and Accreditation Compliance.*

Through better referral tracking, MACH also hopes to improve its compliance with DOD policies, Army policy, TRICARE standards, and Joint Commission on Accreditation of Healthcare Organizations (JCAHO) standards. The Comprehensive Accreditation Manual for Hospitals (CAMH) states that the Coordination of Care of services is:

> "the process of coordinating care or services provided by a health care organization, including referral to appropriate community resources and liaison with others (such as the individual's physician, other health care organizations, or community services involved in care or services) to meet the ongoing identified needs of individuals, to ensure implementation of the plan of care, and to avoid unnecessary duplication of services" [26] (see Table 1).

Standard	Description
CC. 4	The hospital ensures continuity over time among the phases of service to a patient.
CC. 5	The hospital ensures the coordination among the health professionals and services or settings involved in a patient's care.
CC. 6	The hospital provides for referral, transfer, or discharge of the patient to another level of care, health professional, or setting, based on the patient's assessed needs and the hospital's capacity to provide the care.
CC. 7	The hospital ensures that appropriate patient care and clinical information is exchanged when patients are admitted, referred, transferred, or discharged.

Table 1. JCAHO Standards Related to Referral Tracking

***Goal 3**: Prepare for Future Financing Methodologies.*

As TRICARE and DOD funding methodologies evolve, accurate tracking of referrals will support the financial viability of MACH while inaccurate tracking can cost the facility money. Under the current versions of TRICARE resource funding transfer in Regions 3/4, termed the bid price adjustment (BPA), accurate accounting of individual referrals does little to help the hospital's financial bottom line. The BPA is a methodology by which the government pays additional funding to the contractor for work provided above anticipated cost or workload projections determined during a data collection period. The TRICARE Management Agency conducts BPA transactions with the contractors and has not directly passed on the costs to MTFs within older TRICARE Regions. Under new methods of DOD resource funding transfers, such as Revised Financing, the MTF becomes more accountable for its referrals. Most importantly, the timeframe and feedback between service provision and payment shrinks from more than a year to a monthly reconciliation. Therefore, rather than tracking aggregate figures, each MTF must become aware of the individual referrals made to the TRICARE contractor and to ensure they are not obligating the government for services that were not rendered.

Methods and Procedures

A pool of MACH subject matter expert (SME) participants were interviewed to develop data flow diagrams concerning the referral process. Data flow diagrams were created in order to depict the referral tracking system. These diagrams identified the processes, entities involved, and the flow of data between entities. Using the data flow diagrams, the researchers outlined the process and broke it down into its components. The referral tracking SME group identified areas or parts of the process requiring improvement. The results of the initial systems analysis were provided to the SME individuals within MACH to verify accuracy.

Once these diagrams were constructed and validated by the SME participants, the researchers compared the results with those key elements or best practices of referral systems identified earlier. The researchers considered the system analysis results valid and reliable after they were reviewed by at least two additional SME personnel external to the sources involved with the referral process. These sources included the Chief, Department of Family Care and the Chief, Care and Managed Care Division.

In order to outline and describe the current referral tracking at MACH, the researchers used a systems analysis approach. The data flow diagram format used in this study consists of five symbols representing the system elements and their interactions. The symbols include a square representing a process or activity, a thick arrow representing process flow, a thin arrow representing data flow or exchange, a rectangle for participants, and an open-ended box for data files whether paper or electronic.

The referral tracking process at MACH consisted of eight tasks. The main tasks for tracking referrals include the following: initiate routine referral, initiate urgent referral, refer to specialist from civilian PCM, receive emergency or urgent treatment, review MACH referral for medical appropriateness, maximize referrals to DOD specialists from a MACH PCM, refer to civilian specialist from a MACH PCM, and provide feedback to the PCM. These tasks represent an overview of the referral tracking process at MACH. First, patients and providers initiate either a routine, urgent, or emergency referral. The referral may then be reviewed based upon certain criteria, such as "Refer to Civilian Specialist from MACH PCM" or "Review MACH Referral for Medical Appropriateness." Next, attempts are made to maximize the use of DOD specialists. If none are available, the referral is then sent to the installation TRICARE Service Center (TSC) for selection of the appropriate civilian specialist. Civilian PCMs send their referrals to the TSC for selection of the appropriate specialist. Finally, the tracking is complete when the PCM receives feedback from the specialist in the form of a consultation.

Results

Best Practices Defined in the Literature.

The literature review helped identify the key elements or best practices of referral management systems. Very few articles discuss tracking referrals directly while many describe ways to increase the efficiency and control of referrals such as prospective reviews or PCM authorization systems. Upon completion of the systems analysis, the elements of referral control measures and tracking systems identified in literature were compared with those elements present in the current referral system at MACH. The results were then displayed in Table 2.

Elements of the Referral System in Literature	***Present in MACH System?***
Authorization of Single Visit Only	No
Prohibition of Secondary Referrals without PCM Approval	Yes
Prospective Review of Referrals	No
Limited Self-Referrals	Yes
Referral Form Standards	No
Large Case Managers	Yes
Capture of Utilization	No
Capture of Cost Data	No
PCM Authorization System	Yes
Choose Specialists Based on Demonstrated Practice Patterns of Referred Specialists	No
Provide Single Specialist for Consultation	Yes
Utilize Technology to Improve Referral Tracking	No
Educate on Most Common Referrals from PCMs	Yes
Consult with Other PCM on Questionable Referrals	Yes

Table 2. Comparison of Elements in Literature and the Referral System at MACH

Discussion

PCM Education on Most Common Referrals.

Current literature suggests educating the PCM on most often referred conditions.[27] Currently, no standard data is collected. Therefore, the PCM at MACH does not receive any data or information on their top referrals or special treatments.

However, formal data collection of consultation results may further aid the PCMs in their consultation decisions. By tracking patient referrals and educating PCMs on consultation results, MACH PCMs may prevent additional referrals, increase patient satisfaction, and save the facility money.

Prospective Review.

A strength of the current system is that all civilian referrals are prospectively reviewed for the appropriate

referral criteria. This step is performed by a TCS Health Care Finder (HCF). The TRICARE Service Center HCF performs this check on all routine referrals received. The HCF requests additional information and forwards to a physician if the referral is determined to be inappropriate. Presently, they allow two days to pass before acting on referrals. This delay could make the difference in optimizing MACH providers or sending the referral to costly civilian specialists.

Case Management.

Case management represents another strength of the referral process at MACH. The goal of case management at MACH is to optimize the patient's self-care capabilities, promote efficient use of resources, provide quality of care across the continuum, and enhance the patient's quality of life. In addition, the case managers at MACH track active duty soldiers that receive care in civilian facilities. The case manager is the link between the active duty soldier's unit, civilian specialists, and MACH providers. To do this, case managers follow the patient's treatment plan and assist the civilian facility in the coordination of the patient's return to MACH, his unit, and his follow-up care.

Referrals Require PCM Approval.

All referrals require PCM approval in the MACH tracking system. This even applies to referrals generated by MACH specialists. If the MACH HCFs receive referrals from even MACH specialists for patients, the HCF will forward the request to the patient's PCM for approval.

Single Specialist for Consultation.

Another strength of the MACH referral process is that patients are referred to a single specific provider. Although the HCF or PCM may contact more than one specialist in order to determine availability, the patient will only receive the approved referral for one specific provider. This prevents the patient from having to contact numerous specialists in order to determine availability. Further, this places MACH in a better position to control the specialist that the patient sees and can potentially exclude that provider from seeing MACH patients.

Aggregate Referral Tracking.

Perhaps the greatest weakness of the referral tracking system at MACH is that there was very little "tracking" actually occurring. The PCM who generates a referral may ask their patients to make follow up visits after their specialist visit. Unless the patient makes this follow up visit or the PCM receives a return consultation, the PCM does not track referrals on most patients, nor does he or she even know if the patient made their appointment. As a result, patients currently have the burden of tracking their referrals.

Even the referral tracking databases used by the MACH TSC and the HCFs are not used to track referrals but to cover the section in case of misplaced documents. Therefore, the tracking of patients from PCM to consultant and back to PCM does not exist. As a result, the MACH leadership cannot optimize services and effectively manage their patient population with its current system.

PCM Feedback.

Another significant weakness of the current system is the lack of feedback to PCMs. The PCMs are in need of feedback tools to help them manage their empanelled patient referrals. For example, a report that provides PCMs with a list of their monthly referrals would significantly aid PCMs in managing the care for enrolled beneficiaries. In order for MACH to effectively provide feedback to the PCM, they must provide each one with a list of their top referrals, drugs prescribed, tests ordered, and other important indicators.

Multiple Visits per Single Referral.

In order for the tightest control or tracking of referrals, Kongstvedt recommends a single visit per referral request.[3] The PCMs are then required to authorize all other requests. This allows PCMs to maintain accountability of patients, keeps the PCM in the decision cycle at all times, and avoids multiple uncontrolled visits with an unspecified (open-ended) referral.

Contrary to the best practices found in the literature, the MACH PCMs of TRICARE Prime patients were authorizing referral to specialists, rarely providing any limitations on the number of visits or further referral by the specialist. Although this allows more flexibility for the patient, it may cost the facility extra money and prevents

the PCM from effectively performing their role as the patient's care manager. These open-ended referrals, interestingly enough, occur more frequently when patients are referred to MACH specialists as opposed to civilian referrals. Therefore, patients referred to MACH specialists can see the specialist as often as the specialist desires. However, without any built-in feedback loop, the responsibility for the patient's care management may be lost between the PCM and the specialist.

Lack of Referral Form Standards.

There was no standardized format for a PCM referral found during this study. According to Kongstvedt, all referrals should have a standard format that indicates why the patient is being referred, what the perceived diagnosis is or what they are concerned about, what has already been done, and what exactly the PCM wants the consultant to do.[3] Because of the lack of standardization, a PCM may not provide all of this information. This may frustrate the consulted provider, making the visit inefficient and potentially wasting patient and provider time through duplicate tests or therapies. A standardized referral format could also aid in prospective and retrospective reviews. Most importantly however, referral standards may aid in return consultations.

Lack of Utilization Capture.

One of the basic requirements for a managed care plan to control and track referrals is to be able to monitor the utilization of its referrals.[3] In the studied system, MACH was collecting various data on the utilization of referrals; however, at least four different, separate collection systems were used. Furthermore, the data collected was not utilization focused. In fact, the data collected was more for accountability and covering the section in case the referrals got lost in transition between offices. The data fell short of their potential for improving the referral tracking process. If certain data elements, such as the physician name, the type of diagnosis performed, or reasons for the referral type were added and a consolidation of these databases occurred, they could have a significant impact on the process. Furthermore, there appears to be some utilization capture in the CHCS system that is not even used. The extent of this resource needs further investigation, but could potentially provide information for provider feedback.

No Individual Cost Data Captured.

Another major weakness of the current system is the lack of individual cost data capture. Due to the BPA resource methodologies, tracking of referrals by individual is not performed. Currently, there are no incentives for the MTF to capture individual cost data or usage data. However, under future resource methodologies such as Revised Financing, the local MTF will become responsible for payment of care on an individual basis. In order to do this, the MTF must be able to show who received care by civilian providers in order to reconcile bills from the contractor on a monthly basis.

Specialist Not Chosen Based upon Practice Patterns.

The systems analysis also provides evidence that specialist providers are chosen based upon availability and not upon past performance. Additionally, no data or information is captured to reflect the outcomes of these specialist visits. Therefore, providers and HCFs may be sending patients to ineffective and costly physicians without even knowing it. These providers may ask patients to complete duplicate tests or perform duplicate therapies without the patient's best interest in mind.

Technology Not Used to Improve Referral Tracking.

The system analysis also showed that the MTF might not be maximizing their technology advantages to improve referral tracking. Current literature suggests using available technology to improve the referral process. These technologies may be as basic as a return mailer for consultations or as advanced as interactive phone services. In addition, there is some evidence to suggest that the MACH medical information system, the Composite Health Care System (CHCS), has capabilities that have not been fully utilized. These capabilities include improving the electronic referral record and managing provider templates more efficiently.

Other technologies are becoming available to the MTF that may aid the referral tracking at the MTF. These technologies include phone dictation system capabilities, a hospital Intranet, and even basic email. A simple change to

more current versions of database software is also needed. Further study is required, however, to determine the extent of the systems capabilities in aiding the entire process.

Duplication of Responsibilities.

One of the major advantages of using data flow diagrams is that they help identify duplication of responsibilities. The data flow diagrams of the MACH referral process point to duplication in several key areas of responsibility. These areas include the tracking of referrals with different databases and receiving requests for referral. At least four different databases and participants are currently involved in the receipt and data capture of referrals. The MACH HCF section, TSC HCF personnel, the managed care health benefits advisor, and MACH appointments cell receive and manage referrals for patients. Unfortunately, these four sections handle information, but their databases do not communicate this information with each other. A clearer picture of all referrals could be gained by using a single database to manage them.

Discussion

With the changes looming in resource methodologies and the imperative to optimize services, MACH must track all referrals on an individual basis. This could give the PCM a valuable tool to perform their daily job of managing impaneled patients, especially those referred to specialists. This tracking should include all patient referrals regardless of whether they are referred to MACH or civilian specialists. By tracking these referrals, the MACH staff can use the information collected to maximize its available services and avoid costly referrals to civilian specialists. If the improved systems are designed properly, the leadership could even use this information to make strategic decisions regarding the advisability of expanding or limiting specific services at the hospital. Once data is collected and analyzed on an individual basis, the most efficient and effective practices could be identified. The leadership can use this to educate the staff.

As a result of the SME review and recommendations, the MACH leadership consolidated referral traffic into a single focal point under the oversight of the hospital's access manager, the Chief of the Clinical Support Division (CSD). Under the Chief, CSD, the office receives all initial referrals and consults from PCMs and specialists, as well as urgent and emergency referrals. This allows the office to use a centralized approach to track the details of each referral.

The CSD created a consolidated database using Microsoft Access and placed it on the hospital's shared network using Windows NT. The database was built based upon the needs of the organization to meet the goals outlined earlier, in particular, that of optimizing services. Using this database, the CSD has begun tracking all referrals. This is enabling MACH to effectively implement the PCM Authorization System described earlier. Any referral the office receives from a specialist is immediately forwarded to the patient's PCM for approval. Now that the referrals are captured by a consolidated database, MACH has the ability to identify and optimize those services offered but frequently forwarded to the contractor.

Another initiative in progress is using the consolidated database to provide tools for PCMs to manage their impaneled population. Monthly referral lists are being developed that will be given to each PCM to outline their referrals. The PCMs can use this list as a check and balance and to track when to follow up with high-risk patients. In addition, PCMs will also have online access to the database to track when returned referral information is received. These initiatives will give PCMs more leverage to manage their population.

Conclusion

The major intent of this article was to outline the process used in identifying the strengths and weaknesses of the referral tracking system and how those areas could be improved. The researchers reviewed current referral management literature and conducted an analysis of the existing referral tracking system. This was outlined through data flow diagrams with narrative descriptions and then compared against the optimal elements of referral tracking management found in the literature. Recommendations include tracking referrals on an individual basis, consolidating the processing of all referrals into a central database, and improving the effectiveness and usefulness of the databases used in tracking referrals. In conclusion, by consolidating referrals into a single office with a unified implementation plan and

using an integrated database that can be accessed by the appropriate staff, MACH hopes to optimize services, prepare for changing resource methodologies, and provide a tool that can aid PCMs in managing their population.

References

1. Fox P. An overview of managed care. In: Kongstvedt P, ed. *Essentials of Managed Health Care*. 2nd ed. Gaithersburg, MD: Aspen; 1997:p 3-16.

2. Sultz HA, KM Young. *Health Care: USA Understanding its Organization and Delivery*. Gaithersburg, MD: Aspen Publishers, Inc; 1997.

3. Kongstvedt P. *Essentials of Managed Health Care*. 2nd ed. Gaithersburg, MD: Aspen Publication; 1997.

4. Wagner E. Types of managed care organizations. In: P. Kongstvedt, ed. *Essentials of Managed Health Care*. 2nd ed. Gaithersburg, MD: Aspen; 1997: p 36-48.

5. Assistant Secretary of Defense (Health Affairs). MHS optimization plan. *Available:www.tricare.osd.mil/mhsoptplan/plan_summary/plan_summary.html*. March 2000.

6. Rognehaugh R. The Managed Health Care Dictionary. 2nd ed. Gaithersburg, MD: Aspen; 1998.

7. Rakel E, ed. *Textbook of Family Practice*. 5th ed. Philadelphia: Saunders; 1995.

8. Curry R, Crandall L, Coggins W. The referral process: A study of one method for improving communication between rural practitioners and consultants. *J Fam Pract*. 1980;10(2): 287-291.

9. Bourget C, Gilchrist V, McCord G. The Consultation and Referral Process: A Report from NEON. Northeastern Ohio Network. *J Fam Pract*. 1998;46,47-53.

10. McPhee S, et al. How good is communication between primary care physicians and subspecialty consultants. *Arch Intern Med*. 1984;144:1265-8

11. D'Amaro R, Thomas C. Achieving a competitive advantage through referral management. *J Med Pract Management*. 1989;5(1):28-33.

12. Donohoe M, et al. Reasons for outpatient referrals from generalists to specialists. *J Gen Intern Med*. 1999;14:281-286.

13. Glenn J, et al. Physician referrals in a competitive environment. An estimate of the economic impact of a referral. *J Am Med Assoc*. 1987;258:1920-3.

14. Grembowski DE, et al. Managed care and physician referral. *Med Care Res Review*. 1998;55(1):3-31.

15. Cho J, et al. A prospective review system of nonurgent consultation requests in a family medicine residency practice. *Fam Med*. 1993;25(9):570-5.

16. Fertig A, et al. Understanding variation in rates of referral among general practitioners: Are inappropriate referrals important and would guidelines help to reduce rates? *Br Med J*. 1993; 307:1467-1470.

17. Reynolds G, Chitnis J, Roland M. General practitioner outpatient referrals: Do good doctors refer more patients to hospital? *Br Med J*. 1991;302:1250-1252.

18. Geyman J. Communication problems and needs in the consultation and referral process. *J Am Board Fam Pract*. 1994;7(4):357-358.

19. Miller R, Miranda F. Generalist and specialist: the referral process. *J Okla Den Assoc*. 1991;81(4):35-37.

20. Kinnersley P, et al. In-house referral: A primary care alternative to immediate secondary care referral? *Fam Pract*. 1999;16(6):558-561.

21. Cartland J, Yudkowsky B. Barriers to pediatric referral in managed care systems. Pediatrics. 1992;89(2):183-92.

22. Jones V, et al. Subspecialist referrals in an academic, pediatric setting: Rationale, rates, and compliance. *Am J Managed Care*. 1997;3(9):1307-11.

23. Wilson R. The referral process. *J Alabama Dental Assoc*. 1987;42-4.

24. Edwards R. *Improving the consult management process at David Grant Medical Center*, Unpublished masters graduate management project, U.S. Army-Baylor University, Texas; 1989.

25. Assistant Secretary of Defense (Health Affairs). *Summary of TRICARE final rule*. Available: www.tricare.osd.mil/tricare/rule/trisum.*html*. October 1995.

26. Joint Commission on Accreditation of Healthcare Organizations. *Comprehensive Accreditation Manual for Hospitals: The Official Handbook*. Oakbrook Terrace, IL: Author. May 2000.

27. Forrest CB, et al. The pediatric primary-specialty care interface: How pediatricians refer children and adolescents to specialty care. *Arch Pediatr Adolesc Med*. 1999;153: 705-714.

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Developing a Management of Care Plan

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As a large purchaser of care and a large provider of health care benefits, the Department of Defense (DOD) has experienced many of the same challenges as the civilian health care industry. In response to rising costs and issues of access and quality, the DOD initiated TRICARE, its own managed care program. Previously, patients were assigned or empanelled to a clinic, such as Family Practice or Internal Medicine, but not to a specific provider. However, DOD has recently directed that a Primary Care Manager (PCM) manage the care of designated patients. Moncrief Army Community Hospital (MACH) is in the process of initiating the new DOD program, PCM-byname. This project is an outline of the initial steps taken by the Chief, Department of Family Health at MACH to begin the process of systematically managing the wellness and pathways of care for local eligible beneficiaries. Specifically, this focuses on identification of the highest users of the direct care system enrolled to the Family Health Clinic (FHC). By improving the processes for managing the care of enrolled beneficiaries, the MACH leadership hopes to optimize its services and patient outcomes and effectively implement PCM-byname.

Background

In the mid-1960s, Congress passed legislation creating the Medicare program. This program provided a health care entitlement for America's 65 years and older population and was initially based on a fee-for-service (FFS) reimbursement model. Since a third party paid for the majority of the care, patients were removed from the economic impact of their treatment and continued to consume more care without regard to cost. The FFS system of payments was determined retrospectively based upon the previous year's costs, which did not create incentives for providers or hospitals to implement cost containment measures.[1]

In an effort to reduce the rate of health care cost growth, the federal government initiated a prospective payment system (PPS) in 1983. The system utilized diagnosis-related groups, and was designed to provide a financial incentive to discharge patients as soon as possible and prevent unnecessary procedures and tests.[1] As a result, providers were paid a predetermined amount based on the patient's diagnosis. While the PPS brought about some reduction in health care expenditures, it did not foster long-term decreases in the total cost of health care. Instead, costs were shifted from inpatient hospital services to outpatient services, and total health care expenditures continued to rise.[2]

In response to the perceived failure of these health care-financing systems, there has been an aggressive implementation of managed care.[2] Managed care attempts

to link the delivery of care with the financing of the care. While managed care plans are concerned with providing quality and accessible care, the fundamental function of managed care is to control the utilization of services.[3]

Literature Review

Central to the theory behind managed care is the concept of rendering necessary care rather than financing desired care. Some literature suggests that while the health care industry was largely noncompetitive until the early 1970s, managed care has forced many organizations to become more cost-effective.[4] Because of the growth of managed care plans, many organizations now face brutal competition in the marketplace.[5] However, one of the major concerns about the actual implementation of managed care has been an over-riding emphasis on cost containment, and not on health status improvement or quality of care.[6-8]

Whether or not managed care has solved the escalation of health care costs is still under debate. According to the latest data from the Health Care Financing Activity, health care expenditures exceeded $1.149 trillion in 1998. This represents 13.5% of the $8.51 trillion U.S. Gross Domestic Product (GDP) during 1998. This percentage has remained very similar since 1994, despite continued growth in managed care plan enrollment and reductions in the percentage of health care expenditures going to U.S. hospitals.[9] Alain Enthoven had predicted the failure of managed care several years ago during an analysis of the medical cost growth after managed care arrangements were growing in use and popularity. He stated that consumer price insensitivity was causing managed care to fail in its intended role of controlling the rate of medical cost growth.[10]

Newer literature is now questioning the effectiveness of managed care. Grazier discusses the growing public and medical professional anxiety over the changing health care delivery environment.[11] Although managed care was widely embraced in order to control cost growth, there does not appear to be a reduction in the percent of GDP consumed on health care. Pharmacy cost growth, rising health premiums demanded by managed care plans, widespread provider dissatisfaction, medical consumer protection legislation, and failed efficiencies in many types of managed care delivery structures are the major reasons cited[11]

Another major tenet of managed care is the orientation towards population health and wellness, and the organization of provider networks that take responsibility for this population.[1,3] The managed care model designed to provide the strictest cost and resource control through emphasis on wellness is a Health Maintenance Organization (HMO). The HMO combines health insurance functions with the health care delivery system in an effort to provide care in the most appropriate and least expensive setting.[12] To do this, the HMO uses a PCM, sometimes referred to as a gatekeeper, to manage the care of individual patients. The PCM serves as the entry point into the health care system providing basic medical intervention or authorizing referrals to appropriate specialists. By managing the resources used in the treatment of patients, in particular by preventing unnecessary diagnostic procedures and referrals, HMOs attempt to increase access and quality while reducing the cost to those financing the care.

Managed care organizations may need to review their business practices. Those who purchase care are concerned about the health of their workforce and the overall cost of health care. News stories about Medicare fraud, poor care, hospital/health care staff negligence, and billing manipulation have led to a serious loss of credibility for all health care organizations.[13] Grazier suggests that targeted delivery of services, like in other service industries, are being overlooked by the health care system.[11] Additionally, too much emphasis has been placed on medical algorithms (which were intended to identify inefficient specialists), increased market share (despite poor cost accounting systems), and the gatekeeper concept (who have been forced to assume a greater share of the risk in many managed care contracts).

The general consumer of civilian health care is raising concerns about cost, quality, and access. This is supported by literature suggesting that too much emphasis has been placed on cost containment rather than on health services or quality. Therefore, if managed care is to succeed, it be a coordinated organizational structure which facilitates all aspects of the continuum of care for the enrolled beneficiary. This includes many elements, such as

facilities, clinic hours, support staff, case management, and appropriate health information in order to manage the care of empanelled beneficiaries.

Therefore, several questions arise which the military community must address prior to full implementation of civilian-like HMO activities. First, is the military health system (MHS) actually managing the care of enrolled beneficiaries? Second, does the MHS have the organizational structures in place that can enable the PCM to manage his or her panel? Third, does the MHS have other elements of the managed care system present to reduce the burden on the PCM for issues that effect health status, but cannot be directly affected by the PCM?

Landon et al discuss a framework for assessing how a managed care organization (MCO) can influence care.[14] First, the MCO determines the amount of resources devoted to providers and specialists. Second, the MCO can influence care by the type and amount of patient education. Third, the MCO can determine the amount of emphasis they will place on improving the health of the supported population. Finally, the MCO can influence care by how it influences the plan's physicians. The MCO does this through financial incentives, management strategies, structural characteristics, and information or normative influences. They suggest that case management practices, critical pathways, electronic reminders, and physician extenders are valuable to MCO physicians. However, utilization review, profiling, excessive financial risk, physical surroundings, and staffing mix have demonstrated little or no additional value to MCO physicians.[14]

There is a fair amount of literature written about what needs to be accomplished for primary care management in civilian settings. There are several key elements of primary care in closed panel plans. Closed panel plans often use well-trained nonphysician providers. There is generally good acceptance from members because the primary services rendered are excellent and these providers tend to spend more time with the patients.[3] This trend is likely to continue because nonphysician providers will nearly equal physicians working in primary care by 2005.[15]

Some argue that there is another system of care management hidden from the general view, made up of physician specialists who manage the care for 20% of the U.S. population.[16] This has been disputed by other research. Rosenblatt et al proposed three major criteria for evaluating the primary care services rendered by either primary or specialty physicians.[17] They selected continuity of care, comprehensiveness of care services, and preventive care. Continuity of care was measured by the "majority-of-care" rendered to the Washington-state Medicare-eligible beneficiaries over a 2-year period. They operationally defined this as 50% or more of all care being rendered by a specific provider within the time frame. Comprehensiveness of care was operationally defined by measuring the percent of International Classification of Diseases, Ninth Edition (ICD-9) that fell outside their specialty's normal scope of practice. An example is a dermatologist with ICD-9 codes for hypertension. Preventive care was operationally defined by the presence of the ICD-9 code for the influenza immunization.

General Internists and Family Practitioners provided the majority-of-care for 32.8% of all patients cared for during the 2-year window. The medical subspecialties of Oncology, Rheumatology, and Pulmonology demonstrated majority-of-care relationships with a range of 11.5% to 18.9%. The generalists demonstrated a 73.6% vaccination rate for patients that the generalists were providing the majority-of-care for. The three medical sub-specialties of Oncology, Rheumatology, and Pulmonology demonstrated vaccination rates of 44.5%, 51.8%, and 71.8% respectively. All other specialties were significantly lower in terms of the continuity, comprehensiveness, and prevention services offered to their patients. There are limitations with the research, but it is unlikely that most specialists provide much care beyond the scope of their particular specialty.[17]

The MHS must struggle to become as cost-effective as possible. To successfully implement PCM-byname, the MHS must find ways to conjure sufficient resources for the larger health system that supports the PCM. Patient appointing methodologies, sufficient and properly trained support staff, clinic operating hours, and management information for the clinicians are a few of the "structures" that facilitate the overall care rendered by the PCM.

Ledlow et al write that today's MHS facilities must simultaneously reduce excess utilization (moral hazard), provide high quality care, exceed consumer expectations,

expand primary services to meet TRICARE access standards, and reduce costs.[18] However, this challenging mission statement is quite similar to civilian HMOs. They developed a team-focused approach to long-term beneficiary access issues by empowering the staff. They emphasized customer orientation and employee empowerment. The project resulted in a significant reduction in "unavailable" appointments (13.04% down to 2.20%). While there was no statistical improvement for urgent appointments, access did improve significantly for beneficiary routine and wellness appointments. The business process change was successful and required no additional personnel.[18]

McGraw et al addressed access concerns for primary care services in another way by directly focusing on demand management.[19] They focused on a nurse triage protocol enabling 7,962 patients out of 35,231 during a 9-month period to receive nurse-provided self-care regimes rather than be seen by over-burdened primary care providers. The most common ailments referred for nursing self-care education were rash, sore throat, fever, nausea, vomiting, diarrhea, flu symptoms, and newborn care issues. A 10% random telephone sampling of the 7,962 patients sent home after self-care instruction resulted in 703 (88%) of them improving without further intervention and 754 (95%) indicating that they were satisfied with the care.[19]

Additional research on facilitating increased resource efficiency without increased costs or decreased patient care quality appears to be challenging the traditional iron triangle, which is the inter-relationship between cost, quality, and access. The limited amount of research along this front is largely focusing on creating a total healing environment. The total healing environment (THE) implemented and studied by Malloch, focuses on the patient.[20] She worked with Yavapai Regional Medical Center (YRMC) in Arizona to refocus the culture of the staff from the external clinical model; examples include color of room and the patient's general condition, to a holistic model. The holistic approach includes such elements as the reputation of the hospital, courtesy of the staff, the patient's outlook on life, and the patient's willingness to take self-responsibility. The THE vision was to ensure that the YRMC staff focused on the whole patient in order to deliver wellness. This case study indicated improved operating margins, lower turnover of their nursing staff, and lower lengths of stay.[20] While the author cites several limitations to the study, it does provide an alternative view of how to provide "wellness" to beneficiaries within a managed care setting.

The second healing approach deals with meeting customer expectations. In the past, the primary objective of most health care organizations was to focus only on the medical needs of the patient. This has changed, since the environment for health care service delivery has become so competitive. The focus is changing towards improving the physical environment to raise customer satisfaction with the total health care experience.[21]

To better support the PCM through beneficiary wellness, research has explored the utility of health promotion/preventive medicine. There has been reluctance by the health care community to eagerly embrace this concept. Three major reasons for the reluctance are: first, this concept is markedly different from the acute-care delivery system in-place throughout the country; second, patients are not willing to readily accept behavior change as a treatment option; and third, it is difficult to quantify what "does not" happen. However, health promotion and disease prevention will require intervention efforts by the medical community at the work setting and in the larger environment. Education programs for tobacco prevention and cessation, physical fitness, improved nutrition, stress management, and alcohol/drug abuse prevention are all necessary parts of a good health promotion and disease prevention effort.[22]

The Ambulatory Care Task Force recognized the importance of health promotion and preventive medicine.[23] The Task Force emphasized the role nursing plays in attending to the health promotion and disease prevention needs of the patient. If sufficient time is not available for appropriate patient education during the normal visit, the Task Force suggests scheduling follow-on appointments, telephone follow-up, or arranging referrals to other disciplines (social work, family advocacy, etc). They also discuss the Health Enrollment Assessment Review (HEAR) database as a resource for determining the baseline health status for local beneficiaries. Coupled with the put prevention into practice and good tool immunization programs, HEAR could be an important

tool for measuring changes (outcomes) in the health status of the local beneficiary population. Many authors emphasize the importance of understanding and utilizing data from health care information systems to provide useful measures.[22-24]

Another common tool for civilian managed care organizations to support the PCM is case management. Kaiser Permanente initiated a study on case management for enrolled elderly beneficiaries. This 2-year study was based on an ambulatory group of beneficiaries. The program monitored five outcome measures. These included perceived health status, functional status, satisfaction with care, service usage, and program costs. Previous research has been done on case management demonstrating effectiveness when partnered with a long-term benefit. However, most HMO products do not offer long-term benefits. The Kaiser case management program utilized the disciplines of nursing and social work. In their randomized 2-year trial study, there were few significant or consistent findings. However, the group who received the case management services did demonstrate a significant reduction in emergency room visits during the length of the trial. Unfortunately, the study was unable to demonstrate any reduction in total costs for those who received case management services versus those who did not.[25]

Another issue that the MHS must wrestle with is the patient's overall satisfaction with the health care experience. In a time of constrained resources, health care leaders should note one unique study. Chow et al discuss the dilemma of mounting pressure for civilian health care executives to simultaneously enhance services and control costs.[26] They suggest that the theory of escalation (continuing to throw good money after bad) is present in health care organizations. Escalation was found to be significantly more likely to occur if others in their organization did not know about the lack of profitability of a project. Health care executives must be aware that resources squandered on non-value-added projects do not enhance the bottom line of an organization. This is uniquely critical for capitated organizations like the MHS. Because of the lack of concern over "profitability" the possibility for a non-value-added project to continue may be more likely. Chow et al strongly recommend broad performance measures, like a balanced scorecard, which include both financial and nonfinancial measures to adequately assess a projects value.[26]

Finally, report card research on Magnet Hospitals appears to suggest that institutions that are well run and have higher employee satisfaction are significantly more likely to receive much higher patient satisfaction scores.[27] They also found lower rates of nurse-reported needle-stick injuries. Similarly, Moore et al discuss the ANA Report Card, which attempts to better account for issues of health care quality.[28] They contest that many common indicators used in other report cards have not been related to the care provided. While these studies focus on inpatient settings, they are useful reminders of the need to ensure that any measures used must demonstrate the inter-relationship between cost, quality, and access.

Methodology

The framework for this study is to: first, identify the highest users; second, discover if they are enrolled in TRICARE Prime; third, associate them with a primary care clinic; fourth, assess who their PCM is and whether their care is being managed. Finally, identify descriptive information about the high users enrolled to the FHC. In the future we will review some of the structure issues in order to better provide focused patient education programs, but that is beyond this initial review.

In order to identify the "highest" users, we first needed to define what that meant. We, operationally, defined a high user as the 300 individual beneficiaries, during the period 1 Jan through 30 Jun 00, who used the MACH direct care system more than any others. The Patient Administration Systems and Bio-statistics Activity (PASBA) in San Antonio, Texas, provided these data from the MACH Ambulatory Data System (ADS). The 300 individual highest users were sorted using an ad hoc program written by a PASBA analyst, and yielded a list of users with 28 or more ambulatory encounters at MACH during the 6-month time period.

In order to assess some basic descriptive information on the 300 highest users all data were sorted in an Excel 97 file, by rank. This culled out 89 of the highest users who were U.S. Army (Patient Category A11, A12, A15) in the grade of E-1. These three categories represent Army Active Duty (A11), Army Reserve (A12), and National

Guard (A15) soldiers who are likely to be U.S. Army basic trainees at Fort Jackson, SC. These individuals were removed for later comparison with a data set from the Physical Training Rehabilitation Program (PTRP) to determine if they were trainee high users other than those enrolled in the PTRP.

This left 211 other byname high users. This list was checked against the Composite Health Care System (CHCS) TRICARE Prime enrollment data set. The data were further distinguished, through a review using CHCS, by whether they were enrolled in TRICARE Prime or not. If they were enrolled in TRICARE Prime, the researchers looked to identify what clinic and byname PCM, if assigned, these TRICARE Prime high users were assigned to.

We utilized the Rosenblatt et al criteria for evaluating the continuity of care, measured by the "majority-of-care" rendered during the 6-month period.[17] We used their definition of 50% or more of all care being rendered by a specific provider within the time frame. We did not review comprehensiveness of care or preventive care during this initial study. Finally, we sifted the ADS data for any relevant information to help describe who the highest users of the direct care system were. Specifically, we intended to review what descriptive data are in the ADS records, such as age, gender, rank, patient category, and clinic encounters.

Results

Of the 300 highest users, the range of ambulatory encounters was 28 up to 100 during the 6-month window. The mean number of encounters was around 37 per "high user." The data were broken into three major groups. The first group included 89 of the 300, who were trainees in the grade of E-1. This left 211 other high users. Seventy-four of the remaining 211 were enrolled in TRICARE Prime. This study focused on 63 of the 74, who were enrolled into the FHC at MACH. The third group was the largest, representing 137 of the 300, who were not enrolled in TRICARE Prime.

This project focuses on the 63 highest users who enrolled in TRICARE Prime in the MACH FHC. Ten of the 63 did not have an assigned PCM as of 30 Sep 00. Of the 53 patients who did have an enrollment with a specific FHC PCM, 16 of them were enrolled to one of two providers. The remaining 37 high users were spread amongst 14 other FHC Providers.

A remarkable discovery was the evidence that many high users were able to access the direct care system without necessarily being TRICARE Prime. Another discovery was the inconsistencies within MACH-controlled databases. An example was three active duty personnel, using the direct care system in significant amounts, listed as enrolled in TRICARE Prime with the MCSC. Another example is a group of 26 high user active duty, above the grade of E-1, personnel who are not listed as TRICARE Prime. This is possible though, with the large number of schools and other training programs that soldiers attend at Fort Jackson in a TDY status. However, the largest problem is in trying to match the data on the family members (active duty or retiree) from ADS to CHCS. The remaining 22 high users fall into several other categories.

Basic descriptive data were computed on the data set. The 63 highest users enrolled to the FHC used the direct care system an average of 37.8 visits each during the 6-month period. The range was 28 to 64 visits, with a standard deviation (SD) of 8.6 visits. These high users included 37 active duty, 15 retirees, and 11 family members (either of active duty or retiree). There were a higher number of male high users, 35, than female, 28. The age distribution was a range from 21 to 64 years with a mean age of the FHC high user being 42.

The usage of the FHC by FHC-enrolled high users was interesting. While the mean number of visits during the 6 months was 5.75 visits, with a SD of 5.56, the range was 0 to 23 visits. Twelve high users never went to the FHC during the time frame. Twenty-nine used the FHC between one and six visits. Fourteen used the FHC between seven and 12 visits and the remaining eight had usage rates of 13 visits or greater. This group also utilized other primary care portals in the system. Twenty-seven were seen by the Internal Medicine Clinic at least once. Seven had one or more visits in the Troop Medical Clinic (TMC) and 30 were seen in the Treatment Referral Area (TRA), an acute care clinic, one or more times.

Several clinical services appeared to be associated with rare, but very high usage rates. Use of the Allergy Clinic drove a mean of 3.48 visits with a SD of 8.20 for each of the 63 high users. However, 50 of the patients did not have any allergy visits and three more had only one visit. The remaining ten patients visited the Allergy Clinic an average of 21.6 times each.

Oncology was another clinical service that demonstrated similar findings. The mean number of visits per high user was 1.79 with a SD of 7.38. When the findings are more closely reviewed, 59 had no oncology visits and the remaining four patients used this service about 28 times each.

Physical therapy (PT) usage demonstrated a mean of 8.08 visits per high user with a SD of 12.15. Thirty patients never visited the PT Clinic. Ten used this service between one and 6 times and 23 patients visited PT between seven and 54 times each during the 6-month window.

Occupational therapy (OT) usage was a mean of 1.62 visits with a SD of 4.59. Fifty patients did not use OT, while nine had between one and six visits and four other high users visited OT between 7 and 25 times.

Substance Abuse was the other clinical service that demonstrated unique usage patterns. The mean usage of this service was 5.63 visits each with a SD of 12.68. Fifty-one patients never used this service. One patient used it one time. The other 11 high users visited the Substance Abuse Clinic between 21 and 41 times each.

We compared the number of FHC visits as a percentage of the total cumulative visits by these 63 highest users enrolled to the FHC in order to determine a majority-of-care relationship. The majority-of-care relationship is defined similar to criteria of 50% or more of the care being rendered by the PCM, in this case the FHC.[17] Clearly, the term PCM is loosely applied due to the previous practice of enrolling patients to a clinic (FHC) rather than a byname PCM. Only five of the 63 patients were seen in the FHC greater than 50% of the time if all visits were considered. In fact, 12 patients did not ever visit the FHC, 19 demonstrated usage rates between 1% and 10%, 12 others between 11% and 20%, 11 more between 21% and 30%, and the other four between 31% and 49%.

To better review the data set, we considered the clinic visits in allergy, oncology, PT, OT, and substance abuse as necessary and part of a prescribed treatment protocol. If these services were used at all, they seemed to be associated with a string of return visits. Although relevant and necessary for appropriate care, inclusion of these five services could artificially skew the results. Once those five clinical services were removed from the analysis, 20 of the 63 high users were treated by a FHC provider greater than 50% of the time. The same 12 high users never visited the FHC, four used FHC between 1% and 10%, eight between 11% and 20%, seven between 21% and 30%, and the remaining 12 used the FHC between 31% and 49%.

Discussion

Clearly there are several limitations with this preliminary study. First, these data define a unique window of time. Therefore, most of this care may have been expected. Second, perhaps the definition for continuity of care is still too vague. Third, the ADS data are not well, or fully populated, which will prevent a thorough analysis. This will drive the study group back to the individual patient medical record. Fourth, these patients had not yet been enrolled to a byname PCM for the time frame of the data pull. This severely limits the positive effects of a good PCM to actually begin the management of care for these beneficiaries.

Nonetheless, this study has provided a number of useful by-products. First, perhaps it is useful for future research to identify how to distinguish high use behavior by patients from necessary medical care directed by a provider. We distinguished this by identifying services with rare usage (less than 50% of the high user group), but very high visit (greater than seven) count rates for those who do need the service. The services of allergy, oncology, PT, OT, and substance abuse fit our criteria. Even after removing these five services, only 20 of the 63 (31.7%) of the high users enrolled to the FHC were seen by the clinic providers in a majority-of-care relationship. Perhaps we have an opportunity for improvement in the continuity of care for the 43 patients who did not receive 50% or more of their care in the FHC. This may be useful information to the individual providers as MACH implements PCM-byname. It was also interesting that so many of these

repeat patients had multiple primary care portals. This group demonstrated at least one visit in Internal Medicine (42.8% of the high users), the TMC (11.1% of the high users), and our acute care clinic, the TRA (47.6%).

Another useful finding was that 16 of the highest users were randomly assigned to two providers, 10 high users were not assigned to a specific PCM, and the other 37 high users were more evenly spread between 14 other FHC providers. Two actions are available to management. First, the high users could be redistributed for more equitable sharing of the patient load. Second, although several of the high users were known to the FHC staff by reputation, this analysis provides more information to the providers for their care of these patients. This provides demographic and descriptive information to assist the providers in their practice. Specific areas of interest are the patient category (active duty, family member, retiree, etc), patient age, critical risk factors, as well as the other clinics/ portals of access used to obtain care. Third, supervisors and providers can work together to decide if certain high user patients should be grouped to a provider for the same type of care. For example, if several of the high user patients are being seen for low back pain and chronic pain they may be better managed by only one provider. If one provider is more proficient or qualified to see these types of patients, management and supervisors can assure that these high-risk patients are assigned to this provider. The trade-off is that one provider may have several high user patients on their panel.

Finally, the data indicate that more work must be done to use case management in order to identify all other health or social issues that contribute to the high usage rates for these enrolled beneficiaries. These health and social issues could be measured by including perceived health status, functional status, satisfaction with care, service usage, and program costs. Previous research done on case management could be useful because the MHS must deal with the long-term health and wellness of our beneficiaries. The Kaiser case management program utilized the disciplines of nursing and social work.

Conclusion

There is much more work left to be done. Although the Standard Ambulatory Data Record which populate the ADS have many demographic variables available, they are of little value if they were not completed at the time of the patient-provider encounter. Thus, incomplete data collection or incorrect data entry will skew the analysis. If the PCM does not give an accurate diagnosis for the patient visit, we may identify a high use patient, but for the wrong diagnosis. This limitation can be overcome with an emphasis on education of the staff. Merely being a high user should warrant a closer look at the patient's chart by the case manager or utilization management teams. This allows various facets of the hospital to directly assist the provider for the betterment of patient care. The importance of a team approach to quality patient care is paramount.

The use of data provides invaluable assistance to the team in providing quality patient care. Data quality, which can be a limitation, is a top priority at MACH to help improve the information available to our providers. This information is critical in helping the PCM better manage their panel of beneficiaries. This kind of information will also help the PCM and the FHC support staff tailor patient-specific education programs to help the high users better and more efficiently use MACH services. Part of the vision will be to review other factors on how these high users use the MACH system of care. There is much left to do, but this a critical first step in the process.

References

1. Shultz HA, KM Young. *Health Care: USA Understanding Its Organization and Delivery*. Gaithersburg, MD: Aspen Publishers, Inc; 1997.

2. Fox P. An overview of managed care. In: P Kongstvedt, ed. *Essentials of Managed Health Care*. 2nd ed. Gaithersburg, MD: Aspen; 1997: pp. 3-16.

3. Kongstvedt P. *Essentials of Managed Health Care*. 2nd ed. Gaithersburg, MD: Aspen Publication; 1997.

4. Ginter PM, Swayne LE, Duncan WJ. Strategic Management of Health Care Organizations. 3rd ed. Malden, MA: Blackwell Publishers; 1996.

5. Mowll CA. Assessing the Effect of Increased Managed Care on Hospitals. *J Health Care Mgt*. January/February 1998;43(1):68-78.

6. Kirby EG, Sebastian JG. The Effect of Normative Social Forces on Managed Care Organizations: Implications for Strategic Management. *J Health Care Mgt*. January/February. 1998;43(1):81-95.

7. Drucker P. Management's New Paradigms. *Forbes*. October 5;152-177.

8. Griffith JR. *The Well Managed Health Care Organization*. 3rd ed. AUPHA. Ann Arbor, Michigan: Press/Health Care Administration Press; 1995.

9. Kralovec P, Reczynski S. Profile of U.S. Hospitals. *Hospitals & Health Networks*. Special Fold-Out Section. May 2000;74(5).

10. Enthoven AC. Why Managed Care has Failed to Contain Health Costs. *Health Affairs*. Fall 1993;1993:27-42.

11. Grazier KL. The Future of Managed Care. *J Health care Mgt*. November/December 1999;44(6):423-426.

12. Wagner E. Types of managed care organizations. In: P. Kongstvedt, ed. *Essentials of Managed health Care*. 2nd ed. Gaithersburg, MD: Aspen; 1997:p 36-48.

13. Sherman C, Lando M. Raising Management Standards in American Health care. *Health Care Executive*. March/April 1999;12-17.

14. Landon BE, Wilson IB, Cleary PD. A Conceptual Model of the Effects of Health Care Organizations on the Quality of Medical Care. *JAMA*. 1998;279 (17):1377-1382.

15. Cooper RA, Laud P, Dietrich CL. Current and Projected Workforce of Nonphysician Clinicians. *JAMA*. September 1998;280(9):788-794.

16. Aiken LH, Lewis CE, et al The Contribution of Specialists to the Delivery of Primary Care. *N Engl J Med*. 1979;300:1363-1370.

17. Rosenblatt RA, Hart G, et al. The Generalist Role of Specialty Physicians. *JAMA*. 1998;279(17):1364-1370.

18. Ledlow GR, et al. Primary Care Access Improvement: An Empowerment-Interaction Model. *Mil Med*. May 2000;165:390-395.

19. McGraw E, et al. A Model for Demand Management in a Managed Care Environment. *Mil Med*. April 2000;165:305-308.

20. Malloch K. A Total Healing Environment: The Yavapi Regional Medical Center Story. *J Health Care Mgt*. November/December 1999;44(6):495-512.

21. Fottler MD, et al. Creating a Healing Environment: The Importance of the Service Setting in the New Consumer-Oriented Health Care System. *J Health Care Mgt*. March/April 2000;45(2):91-99.

22. Teft RJ. Ensuring Force Readiness and Beneficiary Health through Health Promotion and Preventive Medicine in the Military Health System: A Position Paper. *Mil Med*. December 1999;164:857-862.

23. Ambulatory Care Task Force. Managing Care in an Ambulatory Environment. *Army Nurse* Corps. 1997.

24. Austin CJ, Homberger KD. Managing Information Resources: A Study of Ten Health care Organizations. *J Health Care Mgt*. July/August 2000;45 (4):229-239.

25. Marshall BS, Long ML, et al. Case Management of the Elderly in a HMO: The Implications for Program Administration Under Managed Care. *J Health Care Mgt*. November/December 1999;44(6):477-494.

26. Chow CW, Ganulin D, et al. Increasing the Effectiveness of Resource Deployment in Healthcare Organizations. *J Health Care Mgt*. November/December 1999 44(6);513-528.

27. Havens DS, Aiken LH. Shaping Systems to Promote Desired Outcomes. *JONA*. 1999; 29(2):14-20.

28. Moore K, Lynn MR, et al. Implementation of the ANA Report Card. *JONA*. 1999; 29(6):48-54.

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Identification of Success Factors for Completing the Physical Training Rehabilitation Program

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Introduction

Despite advances in technology such as more accurate weapons systems, improved medical equipment, and more reliable and user friendly vehicles, the fact remains that military life can be physically demanding. Consequently, service members must be physically fit in order to succeed in the armed forces.

Physical fitness training starts in the basic training courses of each service and continues throughout a service member's career. To maximize the likelihood that a soldier graduates from basic training, the recruit should be physically fit prior to entering the service. Unfortunately, many young men and women begin basic training without an adequate level of fitness to ensure success. Recruits that lack adequate conditioning prior to basic training run a greater risk of being injured during training and are slower to heal from those injuries. DeFraites demonstrated that the rate and incidence of injuries occurring during basic training has been on a slow rise over the last two decades.[1] It follows that this rise in injuries may lead to an increase in the early discharge rate of recruits who can not meet the physical demands of basic training.

Besides appropriate acute medical care, interventions to decrease the injury related discharge rate fall into two general categories, prevention and rehabilitation. The Fitness Training Company (FTC) is one example of prevention. Recruits who do not meet minimum fitness standards upon arrival at the basic training site are placed into the FTC where they undergo individualized programs to improve their levels of fitness. Once they meet those minimum standards, they may begin the regular basic training schedule.

An example of rehabilitation interventions is the Physical Training Rehabilitation Program (PTRP) implemented at the Army's largest basic training post, Fort Jackson, SC. The PTRP was designed to "rehabilitate those highly motivated, quality soldiers who were injured during Basic Training…and still desire to finish their training."[2] The PTRP strives to provide an environment that ensures healing and recovery from debilitating injuries through physical and mental fitness instruction, enabling completion of basic training. Approximately 40% of the soldiers who enter PTRP successfully return to basic training. The other 60% are separated from the service despite, in some cases, receiving months of rehabilitation at PTRP. The demonstrated success in returning many injured soldiers back to basic training units resulted in the U.S. Army Training and Doctrine Command (TRADOC) issuing a policy change for TRADOC Regulation 350-6, effective 21 Jan 00. The new regulation mandates that all TRADOC Basic Combat Training (BCT)/One-station Unit Training initial entry installations establish a PTRP.[3]

The intent to rehabilitate and provide soldiers the opportunity to finish basic training and continue with their military career is laudable. In a world of limitless resources

every soldier should be afforded that opportunity. However, in an era of tight dollars and shortages in military medical staffing, one must determine the economic value-added benefit of each program. Approximately 60% of PTRP soldiers fail to return to basic training. One may assume that there is a cost involved in maintaining those soldiers in PTRP. Those costs include housing, feeding, man-hours for supervision and training, medical care, trainee salaries, etc. A follow-on assumption is that one decreases costs and increases the economic value-added benefit of PTRP if one can predict in advance which soldiers are likely to return to basic training from PTRP. Those soldiers with low rehabilitation potential would get immediate medical separations without the expense of a PTRP trial.

The purpose of this study is to analyze existing data from the PTRP and begin the process of developing a predictive model of characteristics that will identify soldiers most likely to benefit from enrollment in PTRP. A review of the literature identified several physical, psychological, and demographic factors that correlate with failure to complete basic training. Physical characteristics included significant injuries prior to service, low overall fitness prior to entering training, lower aerobic fitness, significantly weaker lower body strength, and smoking.[4-7] Psychological characteristics included difficulty adapting to stressful situations, prior history of depression or other psychological conditions, and a history of sexual abuse.[8-15] Demographic characteristics of female gender, lower education level, and lower socioeconomic status have also been associated with a higher likelihood of discharge.[16-18] The study design was a retrospective analysis of existing data from a PTRP soldier participant database maintained by the FTC administrative staff since the program's inception.

Methodology

The study subjects were 1,452 soldiers admitted to the PTRP during FY 00 (1 Oct 99 – 30 Sep 00). Soldiers who entered PTRP due to injury or illness while participating in BCT were included. Soldiers who entered PTRP from other units were excluded. Since successful return to duty was the primary outcome measure of the study, soldiers without a final disposition from PTRP were also excluded from the study.

This left a total sample population of 1,005 records. The original data set included 13 data elements. In addition to last name, first name, and social security number, the data set included arrival and departure dates, rank, gender, service component, prior enrollment at the FTC, status (completion, failure, or discharge disposition from PTRP), a text description of injury, and military occupational specialty (MOS). Those characteristics available within the existing data served as variables in the data analysis.

The data elements were modified in order to create multiple mutually exclusive, categorically exhaustive (MECE) variables suitable for statistical analysis. For example, arrival date was converted into four MECE variables representing the four seasons of a year. The months of September through November were coded as fall, December through February as winter, March through May as spring, and June through August as summer. Each of the MECE variables received a one (1) if the soldier entered during that particular season, zero (0) if otherwise. "Departure Date" was not available in a suitable format, so length of stay in PTRP could not be calculated.

The data element "Rank" was similarly divided into four unique MECE variables. Each variable represented one rank (for example E-1, E-2, E-3, E-4). The numeral one (1) was used to identify the appropriate rank level and zero's (0) for each of the other possible ranks. Other MECE variables included gender (0=male, 1=female), prior attendance at FTC, three variables for component of service (Regular Army, Army National Guard, Enlisted Reserve), 25 MOS variables, seven injury type variables, and disposition (0=failure, 1=successful return to basic training). An MOS was given a unique MECE variable if 10 or more soldiers from that MOS were enrolled in PTRP. This resulted in 24 unique variables and one "Other MOS" variable.

The data element injury type was reviewed for common data entries. These were categorized into seven major categories of injury or illness each with its own MECE variable. These included femur injury, knee injury, hip injury, other lower extremity injury, back injury, upper body injury, and illness/genetic condition. The creation of these independent variables resulted in 994 complete records available for regression analysis.

There were no data elements characterizing mental health in the existing PTRP database. However, studies by Knobler et al, Gold and Friedman, and Lerew et al suggest that mental health may be a possible predictor of successful PTRP completion.[8-10] A review of existing Ambulatory Data System (ADS) records for soldiers in the grades of E-1 to E-4 during FY 00 with a visit to Community Mental Health Service ([CMHS] MEPRS code BF**) was compared to the subject records for the same time period. The ADS evidence of a CMHS visit was recorded as a "1" in the MECE variable "CMHS_VIS."

The data set, which was originally entered in an Excel 97 spreadsheet, was saved as a database file and then imported into Statistical Packages for the Social Sciences (SPSS) version for Windows 9.0 (Chicago, Ill). The data were entered for a linear regression, with the dependent variable "SUCCESS" and the aforementioned 46 independent variables. The Pearson's *r* correlation test was used to test for the strength of the relationships between the different variables.

Results

Twenty-one percent of the 1005 PTRP candidates had previously been assigned to the FTC prior to being assigned to a Basic Training Battalion. Sixty-nine percent of the PTRP population were female soldiers. Additionally, 15% of the soldiers had been seen in the CMHS at least one time, prior to or during, their stay in PTRP. The descriptive data for service component, gender, and rank have been combined into Table 1.

Table 2 presents injury type as compared with gender, CMHS visits, and FTC attendance prior to basic training entry using a Pearson's *r* correlation test and confirmed by a chi-squared test. *P* values <.05 are indicated by an asterisk. There was no significant relationship between type of injury and CMHS visits. However, soldiers with hip and back injuries were more likely to have attended the FTC fitness improvement program prior to entry into basic training ($P<.05$). The relationship between gender and four injury types were statistically significant. Females were more likely to have hip ($P<.0005$) and other lower extremity injuries ($P<.01$) while males were more likely to have upper body injuries ($P<.0005$) and illness ($P<.001$). Twenty-four patients had injuries that did not fit into any of the seven injury categories and were excluded from the analysis presented in Table 2.

	Total	Male	Female
	(n=1005)	(n=311, 30.9%)	(n=694, 69.1%)
Reserve	118, 11.7%	33, 28%	85, 72%
E-1	78	24	54
E-2	22	6	16
E-3	14	3	11
E-4	4	0	4
Nat Guard	152, 15.1%	31, 20.4%	121, 79.6%
E-1	91	20	71
E-2	18	4	14
E-3	36	7	29
E-4	7	0	7
Reg Army	735, 73.1%	247, 33.6%	488, 66.4%
E-1	509	174	335
E-2	107	35	72
E-3	85	26	59
E-4	34	12	22

Table 1. Demographic Information by Gender, Rank, and Service Component

Injury Type	Total	Male	Female	CMHS	FTC
Overall	970	302,31.7%	668, 68.9%	151, 15.6%	204, 21%
Other LE	460, 47.4%	126*	334*	75	97
Knee	214, 22.1%	66	148	34	40
Hip	95, 9.8%	7*	88*	13	28*
Upper body	87, 9%	58*	29*	16	15
Illness	52, 5.4%	26*	26*	4	8
Femur	38, 3.9%	10	28	4	7
Back	24, 2.5%	9	15	5	9*

(* = $P<.05$)

Table 2. Relationship Among Gender, CMHS Visits, FTC Attendance, and Injury Type

The number of soldiers who received a disposition from PTRP was reviewed by season. Thirty-two percent of the total PTRP population started in the Spring, 31% started in the Fall, and 26 % started in the Winter. The remaining low percentage of 11% for the Summer season is likely due to the PTRP participants who started in the summer months but had not yet received a disposition as of 30 Sep 00. As a result, many summer starters were excluded from the initial subject group, effectively lowering the contribution of summer soldiers.

The MOS 71L was the largest single MOS represented with 7.04%. The nine next largest MOS groups were, 92A (6.24%), 91B (5.23%), 75B (4.53%), 88M (4.33%), 92Y (4.12%), 92G (4.02%), 63B (3.82%), 77F (3.72%), and 75H (3.22%). The other 14 identified MOS groups had populations between 10 and 27, and each represented between 1.01% and 2.72% of the 994 total complete data records. The remaining MOS designations were all rolled into one large group which accounted for 32% of the population.

The dependent variable, "SUCCESS," showed that 40% of the total population completed PTRP successfully and returned to BCT. While not specifically tested for in this initial study, the reasons for nonsuccessful discharge from the PTRP included, Chapter 11 (35%), Chapter 5-EPTS (11%), Medical Boards (3.5%), Chapter 13 (2.9%), and Chapter 14 (1.6%). There were various other removal/ failure categories that accounted for the remaining 6.0%.

The 46 MECE variables were entered into SPSS for a linear regression test versus the dependent variable. The large variables of E-1, Spring, Regular Army, and Other MOS were excluded by the SPSS program, but were accounted for as part of the regression Constant. With the Constant demonstrating a Beta value of .643, this indicates that most soldiers would stand a 64.3% chance of successfully completing PTRP. Positive relationships increase the likelihood of successful completion and negative relationships decrease the likelihood of successful completion of PTRP. Twelve variables reached statistical significance in the regression model. Eight variables decreased the likelihood of PTRP completion: CMHS visit ($P<.000$), Winter ($P< .001$), Fall ($P<.001$) Female Gender ($P<.01$), prior FTC ($P<.05$), the MOS 63S ($P<.05$), the MOS 31F ($P<.05$), and Back injury ($P<.05$). Four variables increased the likelihood of successful return to basic training: Constant ($P<.000$), E-4 ($P<.005$), Summer ($P<.05$), and the MOS 88N ($P<.05$).

Discussion

The results of this initial study provide some insight into the determinants of success or failure while assigned to the PTRP. The data indicate that a visit to CMHS is strongly related to eventual failure to complete PTRP. This study cannot determine if the visits to CMHS were due to a prior history of mental health issues or that care was needed because of the added stress from the basic training experience. The literature does suggest that either of these could be expected. Knobler et al studied young Israeli soldiers and concluded that the stressful events of military training contributed to the development of psychiatric conditions.[8] Lerew et al found that stressful situation such as BCT, could lead to the development of psychopathology in vulnerable individuals.[10] Cigrang et al reported that many recruits enter basic training with a pre-existing mental condition, such as depression, without prior disclosure of their condition. These conditions often come to light shortly after the recruit begins basic training, evidenced by a low level of motivation or suicidal ideation.[11] The existing data had no way to identify a motivation variable for analysis. The extended stays in PTRP for some soldiers could result in frustration, which may lead to decreased motivation, increasing psychopathology, and a consult to CMHS. This study did not look at the length of stay in the PTRP. Future studies should include overall length of stay as a variable.

The statistical significance of the seasons of the year is likely explained by experimental design. By including subjects who started PTRP during FY00 instead of subjects who were dispositioned from PTRP in FY00, we excluded those who had longer PTRP stays toward the end of the fiscal year (Summer). It is likely that soldiers who spend longer time in PTRP have a lower likelihood of successful completion. If that is the case, then it explains the variation in seasons. The three other seasons had a greater likelihood that all of their long-term soldiers would be included in the subject population. There may be age differences of soldiers training in the summer due to the larger number of school age recruits during that time period. However, the literature contains no reference to

season associated with success or failure of basic training.

The variable, Gender, revealed that female soldiers were admitted to the PTRP twice as often as males. Similarly, the data showed that females failed to complete PTRP more often than their male counterparts. The current data is strongly supported by the literature, which showed that females were injured more often and discharged from the service more often than males. Kelly et al showed that female Navy recruits were more likely to suffer pelvic stress fractures than male recruits under the same conditions. Although a rare occurrence, pelvic stress fractures can result in lost training time of up to 6 to 12 months and a likely discharge from BCT.[16] Females are also 2 to 3 times more likely to suffer from a depressive disorder that results in a discharge than their male counterparts.[11] The beta value indicates that female soldiers are 9.3% less likely to complete PTRP as compared to males.

Soldiers admitted to the PTRP who had attended FTC prior to basic training, stood a 7.8% lower success rate than those soldiers who did not attend FTC before starting basic training. This can be partly explained through the literature. Several sources suggested that lower fitness and poorer lower body strength were highly correlated with failure during initial entry training.[5-7] The FTC was set up to assist incoming soldiers with raising their fitness to a level necessary to start basic training. The hypothesis in this scenario is that soldiers sent to the FTC prior to basic training are in poorer physical condition and have lower strength levels than their peers. This places them at greater risk injury and a less likely successful completion of basic training. Therefore, if soldiers in this category are admitted to PTRP, they are at greater risk of failure to return to BCT and are more likely to be discharged from service.

The only injury category that demonstrated statistical significance in the regression model was back injuries. The soldiers who suffered these types of injuries stood an 8.1% lower chance to successfully complete the PTRP. There are no specific references correlating back injuries with failure of basic training. Numerous sources discussed the relationship between lower body injuries and failure to complete basic training.[5,6] While knee injuries (8.1% lower) and femur injuries (3.0% lower) were associated with PTRP failure, these results were not statistically significant. Interestingly enough, hip injuries were associated with a 1.2% better chance of successful completion of PTRP even though they were more likely to occur in females.

This initial study was unable to clearly explain the correlation between specific MOSs and lower completion rates from PTRP. The MOS 31F (Network Switching Systems Operator) and 63S (Heavy Wheel Vehicle Mechanic) demonstrated a 6.4% to 7.0% lower chance for successful completion of PTRP. Likewise, the MOS 88N (Traffic Management Coordinator) demonstrated a 6.3% greater chance for successful completion of PTRP. Perhaps future research could determine if certain skills or GT scores are indicative of successful completion of basic training. Talcott et al demonstrated that lower education levels are related to lower levels of success in basic training.[18] Perhaps higher GT scores required for certain MOS's may be associated with improved chances for success. The increased success of E-4's who by regulation have completed at least 2 years of college, supports this hypothesis.

The overall regression model had an r score of .388, and r^2 of .151. The adjusted r^2 which adjusts for randomness, reduces the explainable variance to .113 (11.3%). The regression sum of squares was 35.924 with 42 degrees of freedom, yielding a mean square of .855. The computed F value in the ANOVA was 4.017, with $P<.0005$ suggesting that these results were not due to statistical error.

This retrospective study was limited by the information in a data set that was not prospectively designed for research. Potentially important variables such as age, disposition date, length of stay in PTRP, well defined injury diagnosis, rehab motivation, prior injury or illness, education level, and GT scores, etc was un-available. The study design likely excluded some summer PTRP participants which places the finding of seasonal statistical significance in question. However, the study met its goal in identifying variables from an existing data set that are related to success or failure to return to basic training from PTRP.

Conclusion

This retrospective study served as the first part in a

three part process to determine a predictor model for PTRP. It preliminarily identified many variables that predicted the PTRP participants' return to BCT. However, the ability to compile a true predictor model of PTRP success or failure was limited by the use of a pre-existing data set. Part two of the process is a prospective study of PTRP participants with an entry questionnaire and follow-up data that include many of the variables mentioned in the discussion above as well as an additional outcome measure of graduation from BCT. The third part will be a prospective study using the predictive variables established from the second study. Its purpose will be to prospectively compare the predictive variables to the achieved outcome.

References

1. DeFraites R. Briefing at the MEDCOM Senior Leadership Conference - *Prevention and Control of Injury Among Soldiers.* April 18, 2000.

2. Physical Therapy Rehabilitation Program website. Available: http://jackson-www.army.mil/tccbe/PTRP.htm; 2000.

3. HQ TRADOC Policy for PTRP; 1999. Change to TRADOC Regulation 350-6, Initial Entry Training Policies and Administration; 2000.

4. Dunn J. Air Force Losses Due to Existing Prior to Service Medical Conditions: A 9-Year Study. *Mil Med.* September 1968;133:738-742.

5. Rayson M, Harwood G, Nevil A. Fitness, performance, and risk of Injury in British Army officer Cadets. *Mil Med.* 1999;64:428-434.

6. Pope R, et al. Predicting Attrition in basic military training. *Mil Med.* 1999;164:710-714.

7. Hoffman J, et al. The effect of leg strength on the incidence of lower extremity overuse injuries during military training. *Mil Med.* 1999;164:153-156.

8. Knobler H, et al. First Psychotic Episodes among Israeli Youth during Military Service. *Mil Med.* 2000;165:169-172.

9. Gold M, Friedman S. Cadet basic training: An ethnographic study of stress and coping. *Mil Med.* 2000;165:147-152.

10. Lerew D, Schmidt N, Jackson R. Evaluation of psychological risk factors: prospective prediction of psychopathology during basic training. *Mil Med.* 1999;164:509-513.

11. Cigrang J, Carbone E, Todd S, Fiedler E. Mental health attrition from Air Force basic military training. *Mil Med.* 1998;163:834-838.

12. Clark K, et al. Reducing Medical Attrition: The Role of the Accession Medical Standards Analysis and Research Activity. *Mil Med.* 1999;164:485-487.

13. Rosen L, Weber J, Martin L. Gender-related personal attributes and psychological adjustment among U.S. Army soldiers. *Mil Med.* 2000;165:54-59.

14. Smikle C, et al. The impact of sexual abuse on job attrition in military recruits. *Mil Med.* 1996;161:146-148.

15. Crawford S, Fiedler E. Childhood physical and sexual abuse and failure to complete military basic training. *Mil Med.* 1992;157:645-648.

16. Kelly E, et al. Stress fractures of the pelvis in female navy recruits: an analysis of possible mechanisms of injury. *Mil Med.* 2000;165:142-146.

17. Pope R. Prevention of pelvic stress fractures in female Army recruits. *Mil Med.* 1999;164:370-373.

18. Talcott W, et al. Prevalence and predictors of discharge in U.S. Air Force basic military training. *Mil Med.* 1999;164:269-274.

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Zolpidem-Induced Hallucinations in an Active Duty Soldier

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Zolpidem is a commonly prescribed non-benzodiazepine sedative for the treatment of insomnia. The most commonly observed side effects include centeral nervous system and gastrointestinal symptoms.[1] We report a case of a young, healthy, active duty soldier who experienced zolpidem-induced hallucinations.

The patient is a 23-year-old Hispanic male referred by his master level social worker for an evaluation of antidepressant medication. The patient had no previous contact with mental health professionals and no history of psychosis. He was diagnosed with a major depressive episode, mild, without psychotic features. At the time of evaluation, he denied the use of alcohol, tobacco, and illicit substances. He also denied the use of prescription or over-the-counter medications. He described difficulties getting to sleep, usually tossing and turning, eventually dozing off well past midnight, and feeling unrested in the morning. He felt this was adversely affecting his physical fitness training and requested a sedative to treat his sleep problem. Venlafaxine (extended release) 75 mg daily was prescribed to be started the following day. A review of clinical laboratories revealed a complete blood count within normal limits and chemistries, thyroid-stimulating hormone, and hepatic panels were all unremarkable. The patient was instructed on sleep hygiene techniques and instructed to take zolpidem 10 mg approximately 30 minutes prior to going to bed. The following morning, the patient returned to our clinic with his immediate supervisor. He stated that he had taken the zolpidem 10 mg tablet and it had taken him about 2 hours to fall asleep. He reported that, approximately 2 hours later, he woke up to use the restroom and felt dizzy. He further reported that he began to see demon-like figures who were calling out to him and suggesting they needed to kill him. His girlfriend reports that the patient seemed "out of it" and did not respond to her calls. She called a friend who came over but the friend was unable to get the patient to respond with anything but gibberish. The friend then summoned the military police, who contacted an emergency medical response team, which was able to get the patient to respond. Upon awakening, the patient had no recall of the events. He felt somewhat confused but was well oriented. Concerned, his chain of command referred the patient to the psychiatry clinic for evaluation. He appeared tired but otherwise denied any psychotic symptoms and his neurological exam was unremarkable. A urine drug screen was negative for illicit substances. A day later, he reported no residual problems related to taking the zolpidem.

Zolpidem-induced psychosis is a rare side effect and has been reported previously.[2-7,9] What makes our case unique is that our patient is male, not on concurrent antidepressant or other medications, and not taking over the 10 mg therapeutic dosage. The case reported by Markowitz et al, occurred in an elderly female taking 20 mg of zolpidem, while concurrently taking warfarin, digoxin, clonazepam, trazodone, and metoprolol.[2] The two cases reported by Cavallaro et al, occurred in an elderly female taking up to 100 mg of zolpidem and a younger patient taking 20 mg of zolpidem for about 2 months.[3] Pitner et al, reported a case in which an elderly female received zolpidem 20 mg prior to undergoing a magnetic resonance imaging and suggested that the psychotic effects of zolpidem may be dose-dependent.[4] Ansseau et al, reported two cases of younger healthy females experiencing psychotic features following a single dose of zolpidem 10 mg.[5] These two patients had not previously

experienced a similar effect after taking short-acting benzodiazepines. Pies reported on a young woman who, having previously taken zolpidem 5 mg without resolution of her insomnia, experienced sensory distortions after taking a 10 mg dose.[6] Notably, all of these cases of zolpidem-induced psychosis involved females. The only case of zolpidem-induced psychosis in males was reported by Elko et al, and involved a number of patients, including two men, who reported visual hallucinations while taking zolpidem concurrently with either selective serotonin-reuptake inhibitors, venlafaxine, or bupropion.[7]

To our knowledge, ours is the only case of a male experiencing zolpidem-induced psychosis while not also taking other medications, including antidepressants. While our patient had been prescribed venlafaxine, he had not yet started using it. Noting that women have between 45%-63% higher zolpidem serum concentrations than men at the same dose, we concur with Markowitz et al and Pitner et al, that the psychotic reactions associated with zolpidem use may be dose- or concentration-dependent.[1,4,8] Therefore, in agreement with Markowitz et al, we believe that zolpidem should be dosed conservatively and that some patients may require smaller doses of zolpidem.[9]

References

1. Marangell LB, Yudofsky SC, Silver JM. Psychopharmacology and Electroconvulsive Therapy. In *The American Psychiatric Press Textbook of Psychiatry*, ed 3, Hales RE, Yudofsky, SC, Talbott JA, editors, pp 1058-9, The American Psychiatric Press, Inc, Washington, DC; 1999.

2. Markowitz JS, Rames LJ, Reeves N, Thomas SG. Zolpidem and Hallucinations. *Ann Emerg Med.* 1997;29(2):300-1.

3. Cavallaro R, Regazzetti MG, Covelli G, Smeraldi E. Tolerance and Withdrawal with Zolpidem. *Lancet.* 1993;342(8867):374-5.

4. Pitner JK, Gardner M, Neville M, Mintzer J. Zolpidem-Induced Psychosis in an Older Woman. *J Am Geriatr Soc.* 1997;45(4):533-4.

5. Ansseau M, Pitchot W, Hansenne M, Moreno. Psychotic Reactions to Zolpidem. *Lancet.* 1992;339(8796):809.

6. Pies RW. Dose-Related Sensory Distortions with Zolpidem. *J Clin Psychiatry.* 1995;56(1):35-6.

7. Elko CH, Burgess JL, Robertson WO. Zolpidem-Associated Hallucination and Serotonin Reuptake Inhibition: A Possible Interaction. *J Toxicol Clin Toxicol.* 1998: 36(3):195-203.

8. Salva P, Costa J. Clinical pharmacokinetics and pharmacokinetics of zolpidem. *Clin Pharmacokinet*. 1995;29:142-153.

9. Markowitz JS, Brewerton TD. Zolpidem-Induced Psychosis. *Ann Clin Psychiatry.* 1996;8(2):89-91.

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Proper Backpack Wear Prevents Injuries

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Army News Flash: Soldiers are now authorized to wear a plain black shoulder bag, gym bag, or backpack over one shoulder, while in uniform. Although this recent amendment to AR 670-1, paragraph 1-10(d), may not be particularly newsworthy to some, the issue of backpacks being worn over one shoulder has raised concerns among many military health care providers. Civilian experts are also concerned with the potential health effects of backpack use. For example, the American Physical Therapy Association issued a news release expressing concerns to parents over the potential risk of injuries to children secondary to improper backpack usage.[1]

For years, soldiers were only authorized to carry bags, other than A.L.I.C.E. (All-purpose, Lightweight, Individual, Carrying, and Equipment) packs, at their side. This one-sided loading demanded a higher energy usage than a two-handed carry and often invoked muscle fatigue in the hand, arm, and shoulder. The revision to the current policy authorizing the use of backpacks was originally a welcome change, as it allows soldiers to carry loads closer to the body's center of mass. However, this decision has raised some debate, because it conflicts with intuitive, ergonomic, and biomechanical principles, which suggest that loads should be carried in a balanced fashion.

Ergonomists and biomechanists have investigated multiple ways in which loads can be carried. Although the best choice for a given situation depends upon such variables as the amount, size, and shape of the weight, as well as distance and terrain over which a weight will be carried, some general principles have been established to minimize undue stress and strain on the human body. For instance, carrying loads near the mid-axis of the body, near its center of gravity, is much less demanding than carrying it further away or toward one side.[1-5] Carrying loads on the back or well distributed across both shoulders and the neck is very efficient.[6] According to a summary of the current literature available on load carriage provided by one ergonomist, carrying a 25-30 kg (55-66 lb) weight, equally distributed across both hands, was one of the most energy consuming methods, while distributing that same weight on the back and chest was one of the least energy demanding methods (see Figure 1).[4,7]



Fig 1. Backpack carried via two-straps with contents weighting 15 lbs.

When a load is distributed asymmetrically, such as when carried in one hand or over one shoulder, there are potential negative consequences. Posturally, the body must adjust position to compensate for the unequal load distribution (see Figures 2 and 3). A recent study involving school age children was conducted comparing the effect of different methods to carry books on static posture and gait

kinematics. Among the three different load carriage conditions (two-strap backpack, one-strap backpack, and one-strap athletic bag), increased lateral spinal deviation (side trunk lean) and shoulder elevation were observed in the one-strap backpack and one-strap athletic bag groups, as compared with the two-strap backpack and no load carrying (control) groups.[8] While asymmetrical loading may require more energy, muscle fatigue and soreness is likely to occur faster in the muscle groups opposing the load, especially if they are contracting for an extended period of time or at a higher percentage of their optimal strength. Although the NIOSH Lifting Equation has been developed for lifting with the hands, asymmetrical lifting is considered as a risk factor that should be avoided or minimized by reducing the load carried.[6] Additionally, the unequal load may result in pain in the muscles under the strap due to compression of these tissues. The pressure of the single strap in the "collarbone" area may also injure nerves that supply the shoulder, arm, and hand. For all these reasons, it seems reasonable to conclude that muscle fatigue and unequal weight distribution across the load bearing joints of the body will increase the risk of developing a musculoskeletal injury.



Fig 2. Backpack carried via one-strap with contents weighing 3lbs.



Fig 3. Backpack carried via one-strap with contents weighing 15 lbs.

In 1998, musculoskeletal injuries accounted for 24% of all outpatient clinic visits among active duty Army personnel.[9] Although it remains to be seen whether carrying loads over one shoulder will increase musculoskeletal injuries among soldiers in the Army, there is one professional group that has been carrying loads over one shoulder for years: postal letter carriers. In 1983, a study comparing letter carriers to meter readers (workers who perform a great deal of walking without significant loads) and office postal workers (workers who lift and carry, without excessive walking) demonstrated that letter carriers sustained a significantly higher number of neck, shoulder, hip and groin, back, and knee injuries than the other two groups of workers.[6]

Although the effects of the amount of weight carried over one shoulder versus two shoulders have not been specifically addressed in controlled research studies, it seems reasonable to conclude that very small loads, carried over short distances, should have a very low risk for injury. However, as the load and/or distance traveled increases, so should the potential risk for injury.

In conclusion, it appears that the risk for injuries should be minimized by distributing the load across two wide, well padded shoulder straps. However, for lighter loads, the convenience and speculated low injury risk of a one-shoulder carry make it the "carry of choice." Therefore, rather than suggesting AR 670-1, paragraph 1-10(d), be modified according to the weight carried, a recommended policy change would allow the soldier to choose when the use of two shoulder straps is better than one.

References

1. American Physical Therapy Association. (Accessed November 1999). The American Physical Therapy Association addresses the benefits and dangers of backpacks. Available: www.apta.org.

2. Bobet J, Norman RW. Effects of load placement on back muscle activity in load carriage. *Eur J Appl Physiol.* 1984;14(2):71-75.

3. Knapik JJ, et al. Soldier performance and strenuous road marching: Influence of load mass and load distribution. *Mil Med.* 1997;162:62-67.

4. Kroemer K, Kroemer H, Kroemer E. Ergonomics: How to Design for Ease and Efficiency. Prentice Hall Intl Series in Industrial and Systems Engineering; Editors: WJ Fabrycky and JH Mize; 1994.

5. Vacheron JJ, Poumarat G, Chandezon R, Vanneuville G. Changes of contour of the spine caused by load carrying. *Surg Radiol Anat.* 1999;21:109-113.

6. Waters T, et al. Revised NIOSH equation for the design and evaluation of manual lifting tasks. *Ergonomics.* 1993;36:749-776.

7. Datta SR, Ramanthan NL. Ergonomic comparison of seven modes of carrying loads on the horizontal plane. *Ergonomics.* 1971; 14(2), 269-278.

8. Pascoe DD, et al. Influence of carrying book bags on gait cycle and posture of youths. *Ergonomics.* 1997; 40(6), 631-641.

9. Defense Medical Epidemiology Database, 1998.

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Celestial Navigation: When Values Serve as Stars

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The only sound was the gentle splash of their paddles on the unbroken river calm. On a cool autumn morning in 1806, a line of canoes entered the Mississippi River in the early dawn mist. Captains Merriweather Lewis and William Clark led their intrepid 30-odd member "Corps of Discovery" on the final leg of their 2,800 mile, 22-month journey. Their approach to the shores of St Louis, marked the completion of the most complex and successful infantry patrol in the history of the U.S. Army.

The mission had been multifaceted: exploration, humanitarian and diplomacy, scientific, cartographic development, and a demonstration of military might. In the course of 2 years, they identified and described 178 new species of plants, 122 species of animals and mapped previously uncharted territory. They accomplished all of this in the face of an unknown and poorly understood enemy: the Native Americans of the Plains and Pacific Northwest. As a testimony to their leadership, medical and public health skills, only one corps member died, probably from appendicitis.

Lewis and Clark followed the rivers, traveling upstream from the Missouri in an effort to find a water route across the continental divide. The rivers they followed coursed with the lay of the land, influenced by climate, rainfall, and season. A major element of the scientific mission was the development of accurate maps to aid in the settlement of the newly acquired Louisiana Purchase. The rivers provided the explorers a route of travel. However, Lewis and Clark used the stars to determine their direction, position, and the distance they had traveled.

Latitude was determined with a sextant by measuring the altitude of the sun at noon to determine the distance from the equator. Longitude was more difficult and involved plotting the position of the moon relative to the stars. The regular, predictable, constant position of the stars such as Antares and Arieties aided them in determining where they were, how far they had traveled, and where they were going.[1]

As the rivers guided Lewis and Clark, in America today, individuals and organizations often use the "lay of the land," the "cultural climate," or the "sociologic season" to determine their route of travel. To truly measure direction, position and distance, however, requires stars. Values, like stars, provide direction. They are the ideal measures of progress. They are both timeless and unchanging. Unfortunately, like the practice of celestial navigation, the knowledge, application, and teaching of values is a dying art. The leadership challenge facing the Army and the Medical Corps in the coming decades is complex, and is frighteningly similar to trying to teach heavenly navigation to a generation of young people who have never looked at the evening sky. It begins with showing them the stars.

Universality and the Loss of Values.

The stars were valuable reference points for the explorers, because the astral positions never changed. Even today, the Big Dipper and Cassiopeia point to Polaris, the North Star. Below the Equator, the Southern Cross can be used to determine "true south."[2] The stars provide direction, but don't define it. In the same way, values do not necessarily define what is right, any more than the stars determine where true north lies. As Stephen Covey has argued, values are the maps but principles are the compass that determines true direction.[3]

The recently articulated Army values of loyalty, duty, respect, selfless service, honor, integrity, and personal courage, are not unique to the U.S. nor to the Army. They are as timeless and unchanging as the stars, and are based on a universal principle. The sacred writings of the world's major religions all emphasize some variation of a rule that demands that others be treated as we would choose to be. It is this principle which dictates that we have a responsibility to care for and about others. "Duty" summarizes the first four values: our social and relational responsibility. "Honor" summaries the last three: our responsibility to ourselves.

One of the primary challenges of this century's end is the decay of belief that something could be absolutely true, and thus something absolutely false. Francis Shaeffer has described this philosophy of our current world as one of no certain truth, and no distinction between what is absolutely right or wrong.[4] C.S. Lewis points out that in this absence of absolute truth, "We make men without chests and expect of them virtue and enterprise. We laugh at honor and are shocked to find traitors in our midst. We castrate and bid the gelding be fruitful."[5]

Many of the young soldiers entering the military have been raised in a culture of values foreign to the Army's. These are the members of the so-called "generation X" steeped in a belief system that emphasizes individualism, personal rights, and the fulfillment of needs and wants. Many lack the knowledge of the "true north" which serves as the basis for the Army's values. One cannot teach values to individuals who have no sense of the absolutes that give values meaning. To teach celestial navigation, we must demonstrate true north.

A Culture of Values.

The American Military Tradition experienced its birth in the person of George Washington. In Washington's Army, vice and immorality were discouraged. Gambling was forbidden, and physical exercise as well as personal health and individual betterment were encouraged. Regular reflection on "true north" was provided for the soldiers. The American Army had worship every Sunday, and attendance was expected. In 1778, with funds in short supply, money was found to supply 20,000 Bibles for the soldiers.

Industry, neatness, and health were the standards for the officer corps and the Army. This sobriety, modesty, interest in character and morals helped to create the American Military Tradition, which was unique in the history of warfare.[6] American Military leaders have, for the most part, reinforced the standard established by Washington. For example, in this century, Eisenhower defined the qualities of a great man as "...vision, integrity, courage, understanding, the power of articulation and profundity of character."[7]

This emphasis on character and integrity are foundational in determining how individuals relate to one another. Fortunately, many soldiers and their families discover the military to be the "culture within a culture" where these values and the principles behind them are the way of life. Thomas Rick has written extensively on the uniqueness of the military culture and its contrast with mainstream America. He writes, "Today's fragmented society is at odds with the classic military values of sacrifice, unity, self-discipline and considering the interests of the group before those of the individual."[8,9]

My children have lived in military housing for 6 years. They have watched the neighbors reach out and support us with meals and child care when my wife accompanied foster children to the mainland U.S. for surgery. They have seen families supporting one another when fathers leave for deployment. They have been scolded and guided by parents who care for them as they care for their own. They are growing up in a world of visual values based upon the principle of caring for others. The fortunate news is that the military tradition and culture of values still exists. The challenge is convincing cynical newcomers to join this "great society."[8,9]

Imparting Values.

In his book on raising boys, Michael Gruian points out that honor and honor codes are essential to the development of boys and men. According to Gurian, adolescent boys are "sponge-like in their absorption of codes of honor suggested to them by their nurturing system."[10] It was not the subject of his book, but I suspect that this sponge-like character is not unique to the male sex. As girls become women in American culture, they are, unfortunately, offered a different code that emphasizes

personal attractiveness and leads women to see themselves as objects.[11] They are no less responsive to honor codes, but are often offered other codes that are less than honorable.

Honor codes and values are imparted through two distinct and essential steps. The emphasis of each of these equally important steps is the key to value reinforcement. Values must be heard and they must be seen. In ancient cultures, stories and beliefs were passed down to children without the benefit of the written word. A model for this communication of values is found in the Bible in the Old Testament book of Deuteronomy:

> "This word which I command thee this day shall be in your heart. Thou shalt teach them diligently unto thy children, and thou shalt talk of them when thou sittest in thine house, and when thou walkest by the way and when thou liest down and when thou risest up. And thou shalt bind them for a sign unto thy hand, and they shalt be as frontlets between thy eyes, and thou shalt write them upon the posts of thy house and upon thy gates.
>
> *Deuteronomy 6:7-9*[12]

In order to successfully impart values to soldiers and junior officers, they must not be merely written on the dog-tags or in the wallet of leaders, they must be "written" in their hearts. Values must be at the core of what the leader says and does. Too often in the Army today, instead of "duty, honor country," what soldiers and subordinates see in an officer is, "me, my ass, and my career."[13]

A life based on values and anchored on principles is not something that happens accidentally. A leader's personal mission statement should be built around values so that the living out of this personal system is a *conscious* effort on his or her part. The best evidence for the existence of true north is its repeated demonstration on the face of a compass. Thus, the leader who sincerely lives by principle-based values embraces the first, essential, and most convincing imperative in teaching them.

Second, leaders must talk about the values they believe both in the home and in the workplace "...thou shalt talk of them." True leaders are lifelong learners. Thus, the reading and study of leadership, culture, values, and principles should be a lifelong pursuit. Eisenhower said, "The one quality that can develop by studious reflection and practice is the leadership of men.[14]

The acme of leadership is to produce the desire in others to lead a life based on the principles and values modeled by their leader. The desire to better understand values and principles, to live them more completely, and to communicate that understanding, should be a consistent effort of every leader. Sincerity demands that, both at the end of the day when exhausted ..."when thou liest down" and at its beginning before the first cup of coffee ..."when thou risest." The leader should live beliefs which are spoken, so that word and deed are also *consistent*.

Finally, in order to successfully impart values, they must be apparent not only all day, but also in every setting. Values and the principles behind them cannot be paraded at counseling sessions or during officer professional development classes, and then abandoned for expediency during inspections or training exercises. The values of the leader must be purposefully demonstrated in the workplace through every decision and action ..."bound as a sign unto thy hand." They must be what subordinates see whenever they look at the leader ..."they shalt be as frontlets between thy eyes." The leader's values and beliefs should also be apparent to both the friend who approaches the "posts of thy house" and to acquaintances, or even enemies, who pass only by "thy gates." The living, breathing practice of values in the leader must be *conspicuous* and evident to all.

Values cannot be learned by hearing or reading alone. They must be witnessed in the lives of credible, inspiring mentors. It is the responsibility of Army leadership at every level and in all branches, to serve as mentors and to impart values *consciously*, *consistently*, and *conspicuously* in every setting and on every occasion. Those who teach values in this manner, and teach others to become teachers as well, invariably learn and understand the values ever better. "Qui docet discit – He who teaches, learns."

Lewis and Clark relied upon the stars to tell them how far they had traveled and where they were going. Leaders who live and teach the Army's values become stars to those they lead. They point by word and deed to values and principles. It can easily be argued that these are

the leaders that the Army desperately needs. These are the leaders whom the Army should promote. And, in fact, it is likely true that only those who act as stars, navigate by the stars, and serve as stars – should wear them.

References

1. Ambrose S. *Undaunted Courage*. New York, NY: Touchstone Books, Simon and Schuster; 1996.

2. Field Manual 21-76, *Survival*. Headquarters Department of the Army. June 1992.

3. Covey S. *Principle-Centered Leadership*. New York, NY: Fireside Book, Simon and Schuster; 1992.

4. Shaeffer FA. *The God Who is There*. Downers Grove II: Intervarsity Press; 1998.

5. Lewis CS. *The Abolition of Man*, Quoted in Bennett, William. New York, NY: The Book of Virtues, Simon and Schuster; 1993.

6. Perret G. *A Country Made by War*. New York, NY: Random House; 1989.

7. Ambrose S. *Eisenhower: Soldier and President*. New York, NY: Touchstone Books, Simon and Schuster; 1990.

8. Ricks TE. "The great society in camouflage." Atlantic Monthly. December 1996:p 24-38.

9. Ricks TE. "The widening gap between the military and society." Atlandtic Monthly. January 1997:p 66-78.

10. Gurian M. *A Fine Young Man*. New York, NY: Putnam Books; 1998.

11. Pipher MB. *Reviving Orphelia: Saving the Selves of Adolescent Girls*. New York, NY: Ballantine Books; 1995.

12. The New American Standard Bible. Carol Streams, II: Creation House Inc; 1973.

13. Kitfiield J. *Prodigal Soldiers*. Washington, DC: Brassey's Publishing; 1995.

14. Quoted in Cohen William A. *The Art of the Leader*. Englewood Cliffs, NJ: Prentice Hall; 1990.

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The Role of Yellow-Tinted Eye Wear in Visual Performance

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There is a persistent perception that visual performance can be improved through the wearing of yellow tinted (blue-blocking) glasses, visors, etc. A review of past studies was conducted to identify a trend in performance effects. An additional series of laboratory and field investigations was conducted to evaluate performance with color identification tasks. The general findings support the conclusion that, while performance for a specific task under specific environmental conditions may be enhanced through the wearing of blue-blocking filters, blanket use of such filters would result in more tasks and conditions where performance is degraded than those where performance is enhanced.

Background

The perception that viewing through "yellow" (also referred to as "minus-blue," "amber," or "blue blocking") filters (glasses, goggles, or visors) improves visual performance has been a persistent one. These filters are particularly popular in fog, haze, and snow environments. While buried in folklore, this concept can be traced back in the literature to as early as 1912.[1] And even today, a reader giving only a cursory look through current general interest hunting and gun magazines will find more than one advertisement for "high contrast" shooter's glasses.

The military has been no exception to the concept of "yellow" goggles or visors. In combat, where even the smallest edge can make the difference between life and death, soldiers, sailors, and aviators have all looked for that one improvement which will make the difference. In response, the tri-service community, over the years, has conducted numerous studies to investigate the possible benefits of using these "vision enhancers."[2-16]

The U.S. Army has had continuous interest in the potential use of "yellow" visors in haze and snow environments. Users among the tri-service community claim that "yellow" filters increase target acquisition performance and enhance contour differences in border detection tasks.[11] However, virtually all studies have failed to find any significant improvement in performance.

In theory, any filter either prevents or reduces the transmission of light of a particular wavelength or band of wavelengths from passing through the filter and into the eye. This action reduces the amount of information which the user receives. Therefore, in principle, these filters cannot allow a user to see "something" which was not there before. However, filters can improve signal to noise ratios, thereby improving probability of target detection.

This article documents the most recent revisiting of the "yellow" visor issue. The Army is currently fielding the newer Head Gear Unit model 56/P (HGU-56/P) aviation helmet. It is replacing the Sound Protective Helmet model 4-B (SPH-4B). Although not authorized for Army-wide use, "yellow" visors have been in use by certain units. These visors were manufactured to fit the older SPH-4 series helmets. As the individual SPH-4B helmets have been replaced, aviators found they could not transfer their yellow visors. This resulted in a flood of requests for HGU-56/P compatible yellow visors. These requests were forwarded to the office of the Program Manager-Aircrew Integrated Systems (PM-ACIS)

Huntsville, AL. The PM-ACIS is responsible for the development of Army aviation life support equipment. In March 1999, the U.S. Army Aeromedical Research Laboratory (USAARL), Fort Rucker, AL, was asked to take another look at the yellow visor performance issue, to include performance for tasks in snow and glacier environments.

Defining the "Yellow" Filter

Before progressing too much further, it is important to point out that this issue is complicated by the fact there is no single "yellow" filter or visor. The use of the qualifying terms "yellow," "amber," and "high contrast" is not well defined.

As explained by Boff and Lincoln, the visible filter colors of yellow and amber do not necessarily relate exactly to specific spectral transmissions.[16] However, all of the various perceptual shades of yellow filters will attenuate the wavelengths in the blue region to some degree. In addition to the transmissions at specific wavelengths, the perception of yellow is also influenced by several factors, such as the type and amount of lighting, the reflectance or emittance of objects, and the adaptive state of the eye to both overall illumination and by wavelength.

Glass filter materials are classified as *ionically colored* from ions of transition elements or rare earths, and/or *colloidally colored.* Most plastic and gel filters are made by dissolving suitable organic dyes into the optical media or its coating.

The Kodak Photographic Filters Handbook lists 10 Wratten filters (No. 2A [pale yellow], 2B, 2E, 3, 8, 9, 11 [yellow-green], 12, 15, and 16 [yellow-orange]) as yellow filters.[17] The primary differences in the spectral curves are the slopes of the curves and the 10% transmission points, where the No. 2B filter transmits approximately 10% at 400 nanometers (nm) and the No. 16 filter transmits 10% at approximately 525 nm. The No. 12 yellow filter transmits approximately 10% at 505 nm.

Schott Optical glass filters label the long pass filters with a suffix according to the approximate 50% transmission point and the prefix color codes for yellow and orange filter series are GG and OG, respectively.[18] The 50% transmission interval between the different long pass filters is approximately 20 nm. The slope of the spectral curves covers approximately 30 nm from the 10% to the 95% transmission points.

Likewise, several versions of yellow visors have been identified. Gentex Corporation, Carbondale, Pennsylvania, a major supplier of protective visors used in the Army, provided USAARL with spectral data for two versions of the yellow visor. They were identified and labeled as "amber" and "high contrast." The amber visor is believed to be of a design developed in the late 1970s; the high contrast visor is of a design developed for the U.S. Air Force for Desert Shield. Figure 1 shows the spectral transmittance curves for these two visors. The amber visor has a 3dB (50%) cutoff at approximately 470 nm; for the high contrast visor, the cutoff point is at a significantly higher wavelength of approximately 515 nm. A sample of another yellow (amber) visor was obtained from an Army aviation unit in Alaska. The spectral transmittance curve for this visor is shown in Figure 2. Also included in Figure 2, for comparison, is the spectral transmittance curve for the Army's Class I clear visor. The yellow (amber) visor shows a 3dB down point at approximately 470 nm and is very likely a sample of the Gentex amber visor.

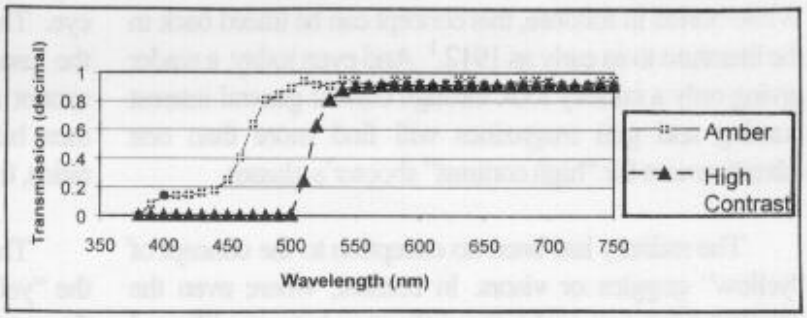


Fig 1. Spectral transmittance curves for Gentex amber and high contrast visors.

Methods

Two approaches were used to assess filter/visor performance. First, a review of current and past literature was conducted. Second, using photographic and video techniques, laboratory and field experiments were

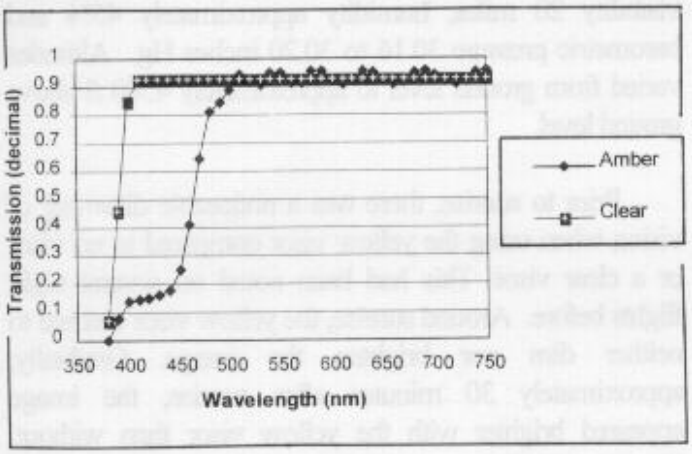


Fig 2. Spectral transmittance curves for Alaskan yellow and Army Class I visors.

conducted to assess the effects of filter use on selected operational tasks.

Literature Review.

The literature search located over 200 papers in which some aspect of the form or function of blue blocking filters was studied. An extensive summary of this research can be found in McLean, W.E. et al.[19] Many of the studies revealed no statistical difference in visual performance with yellow versus neutral filters, nor any increase in target acquisition or stereoacuity performance. However, other studies reported increased contrast sensitivity, as well as greater depth perception in snow under specific lighting conditions. Later studies often challenged these findings, but cited a persistent preference for yellow filters by subjects who often reported that it made things "brighter and sharper." The impact of increased pupil diameter was cited by several studies as a possible explanation for this phenomenon, but still contradictory reports remain among the research findings on this topic.

Photographic and Video Images.

Attempting to describe the effects of yellow filters on various scenes and color shades via theory and spectral plots is not as effective as comparing the images with and without the various yellow filters. A number of laboratory and field experiments were conducted:

• *Color Spectrum.* A standard visible color spectrum chart was viewed with and without a No. 12 yellow Wratten filter (10% at 505 nm and 50% at 515 nm). The primary difference noted was the absence of the blue component below 490 nm which appears black and the color shift towards green for the spectral band between 490 and 560 nm when viewed through the filter. This loss of the blue portion of the visible spectrum is where the term "blue blocker" originates.

• *Color Checker Chart.* The Munsell color checker chart commonly is used in adjusting color balance in sensors and displays. Both photographs and video images of the color checker chart show the same effect when yellow filters are used in front of the sensor such as a video camera or when the unfiltered image is viewed through a No. 12 (515 nm) or the Alaskan visor (470 nm) yellow filters. In actual viewing of the chart, very little changes are seen in the yellows, reds, and greens; and the blues appear as blacks or greens. The gray scale is now a yellow scale where white cannot be distinguished from the yellow color. For individuals with normal color vision, the color perception changes with the yellow filter would be approximately the same.

• *Aviation Sectional Charts.* Aviation maps color code information such as areas with dense populations and urban structures (yellow), water (blue), altitude of terrain (light green for low to dark browns for high terrain), restricted areas (blue), controlled airspace (blues and magenta). When these maps are viewed with the yellow filters, resulting color shifts cause a loss of information. For example, population and urban structures blend away and water and restricted areas appear greenish.

• *Resolution Charts.* High and low contrast Bailey-Lovie charts were viewed and photographed with and without the No. 12 yellow Wratten filter. As in agreement with previous, more controlled studies, no effect on resolution was noted. However, if a difference in resolution is seen with the yellow filter image, the probable cause is the viewer's refractive error and chromatic aberrations of the eye. The few individuals who report resolution improvements also typically see resolution improvements when viewing through small minus power ophthalmic lenses (-0.25 to -0.50 diopter). To determine

the spherical power for a distant lens prescription, eye examiners frequently use the red-green bichrome test, which exploits the color aberrations of the eye. This will be discussed in the effects section of this article.

• *Signaling Smoke Grenades.* Signaling colored smoke canisters were obtained with the colors red, green, yellow, and violet. The canisters were activated at a firefighters' training site and video recorded from both the ground and an orbiting helicopter. For the ground video recordings, one of the two cameras used a yellow No. 12 Wratten filter. Recordings in the aircraft were completed without any filters. The distance from the aircraft to the cannister activation point was approximately 1/4 mile at an above ground level altitude of approximately 600 ft. Viewing the unfiltered ground and air video recordings through the yellow filter showed that the red and green colors were not affected, but the yellow smoke looked white and the violet smoke looked orange, which are the same changes noted when viewing the color checker chart. The ground yellow filtered videotape showed the same color changes.

• *Analysis of Color and Saturation Changes with Yellow Filters.* The color shifts and saturations caused by viewing through two different yellow helmet visors were analyzed by a spreadsheet program previously developed for analyzing filter effects in Army cockpits. The lighter yellow visor transmitted a small percent of blue light and the 50% transmission point occurred at 470 nm. The "high contrast" darker yellow vision did not transmit blue wavelengths and the 50% transmission point was 515 nm (Figure 3). Selected phosphors used in cockpit multi-function color displays and Munsell colored dyes on the Commission Internationale de l'Eclairage (CIE) Uniform Chromaticity Scale (UCS) were modeled with both visors. The analysis showed significant color shifts in the display phosphors and Munsell colored dyes with the yellow visors with more shift from the 515 nm "high contrast" filter than the 470 nm filter. All colors shifted toward the red-green saturation line of the CIE UCS.

• *Personal Observations.* On 16 Mar 99, during a cross country flight from Fort Rucker, AL, to Redstone Arsenal, AL, the following observations were made while wearing yellow and standard gray sun visors installed in an HGU-56/P helmet. Flight times were 0545 to 0900 hours and 1400 to 1600 hours. Conditions were: Skies clear and visibility 20 miles, humidity approximately 45% and barometric pressure 30.16 to 30.20 inches Hg. Altitudes varied from ground level to approximately 4500 ft above ground level.

Prior to sunrise, there was a noticeable dimming of vision when using the yellow visor compared to no visor or a clear visor. This had been noted on several night flights before. Around sunrise, the yellow visor seemed to neither dim nor brighten the image. Gradually, approximately 30 minutes after sunrise, the image appeared brighter with the yellow visor than without. However, neither resolution nor detection appeared to be improved.

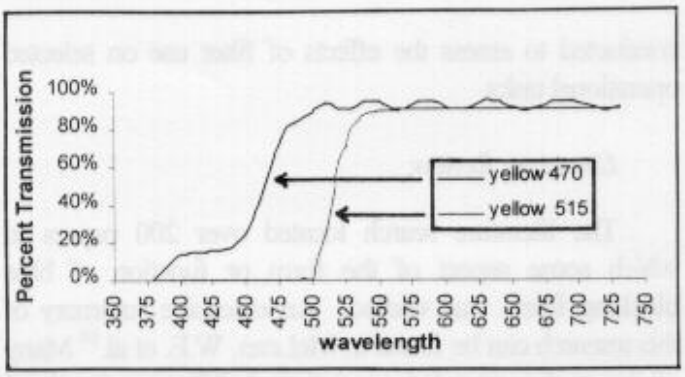


Fig 3. Yellow 470 (left) and 515 (right) visors.

Approximately 30 minutes after sunrise, the tinted sun visor was used in conjunction with the yellow visor on a very bright and clear day, with the following observations comparing the vision with and without the yellow visor:

- Smoke from small brush fires was difficult to detect with the yellow visor. When closer to the fires, the smoke at the source could be seen with the yellow visor, but the size and length of the smoke along the direction of the wind were smaller.

- Water in ponds, creeks, and puddles in fields was more difficult to differentiate from other vegetation with the yellow visor.

- No difference in resolution of wires was noted with or without the yellow visor.

- Dirt roads and trails, brown, clay, and sandy in

color, seemed to have more color contrast with the yellow visor, but there were no parts of the dirt roads that were only visible with the yellow visor and not visible without the yellow visor.

- Hard surface roads had less contrast with the yellow visor than without. However, all roads that could be seen without the visor were visible with the yellow visor.

- The color contrast between green and brown foliage appeared more pronounced with the yellow visor than without. Red and green colors appeared more saturated.

- Immediately after sunrise, fog layers formed over streams and ponds. The top of the fog varied slightly like snow over terrain. No difference was noted between the shape and valleys in the fog with or without the yellow visor.

- Just above the horizon, a thin brownish-yellow layer, probably from industrial discharge, was not visible with the yellow visor. The appearance of haze and aerial perspective were reduced with the yellow visor. At very low altitudes without the yellow visor, tree lines at increasing distances were desaturated with increasing amounts of light gray to white.

Discussion

Contrast and Color Changes.

When the blue end of the spectrum is removed from a scene, there are certain predictable effects on color shifts and contrast of objects within that scene. As shown with the color shift analysis, the reds and greens become more saturated with the yellow filters, and the colors of blue and white are absent (blue is attenuated and white is perceived as yellow).

The appearance of haze is basically white, which means the spectral content is a balance of the red, green, and blue components. When the blue component is filtered out, the haze is not as apparent to the observer, but visibility through the haze is essentially the same. In other words, the visible radiance energy that is transmitted through the atmosphere to the observer would be the same except the blue components would be attenuated with the yellow filter.

At night, colored lights are used at airports to provide information to the pilots. Blue lights outline taxiways. At larger air terminals, green taxiway turnoff lights may be used to lead the pilot on a curved path from the runway centerline to the center of the intersecting taxiway. Taxiway centerline lights, if installed, also are green. With the high contrast yellow visors, pure blue light is not transmitted. All broadband blue lights would appear green. All white or yellow lights would appear yellow.

Placebo and Adaptive Effects.

Improved visibility, acuity, contrast, and brightness were reported by approximately 60% to 70% of individuals participating in previous yellow filter studies.[8,11,20] Reducing the blue components in a scene will give the appearance of reduced haze and potentially dilate the pupils more than the equivalent neutral density transmission. When the blue components of an image are filtered out, the visual system begins to increase the eye sensitivity to blue light. This is easily demonstrated by placing a yellow filter in front of one eye and viewing scenes and backgrounds with broadband spectrums. After only about 1 minute, the initial differences between the color shades seem to diminish between the two eyes except for blue and yellow objects. When the yellow filter is removed, the image previously viewed through the yellow filter will have a distinct bluish or hazy appearance compared to the unaided eye.

Gains and Losses.

Several researchers on the yellow filter issue have mentioned that for any improved contrast between a specific colored target and background with yellow or any other spectral filters, there will also be as many or more color combinations that will yield less contrast and visibility between the object and background. However, removing one of the three primary colors, blue, from the visual image, has the potential to mask objects with blue and white components that are used for color coded information to the aviator.

Refractive Errors.

For individuals who are slightly nearsighted, there is a

possible improvement with the use of yellow filters. As previously noted, the eye has chromatic aberrations, which means red wavelengths focus further from the cornea than green wavelengths; blue wavelengths focus even closer. The red-green bichrome test is used by eye examiners to adjust the spherical component when determining the refractive status of a person. Slightly nearsighted persons see letters clearer in the red end of the spectrum than in the blue end; whereas, slightly farsighted individuals see letters clearer in the blue end of the spectrum. This is very evident to beginning presbyopic aviators, who have noted that aircraft with blue and white cockpit lighting are easier to see than cockpits with red lighting. For those individuals who can demonstrate improved resolution with yellow filters, a similar small minus power spherical lens such as –0.50 diopter will show a similar resolution improvement.

Effects on Night Vision.

As the ambient light level decreases, the visual system shifts from photopic (day) vision to scotopic (night) vision. The cones, which transmit color vision, are less sensitive to light than the rods, which are predominately used for night vision. With the shift from photopic to scotopic vision, the eye also becomes more sensitive to the blue end of the spectrum and less sensitive to the red end. This shift in color sensitivity with changes in light level is called the Purkinje shift. Therefore, the same "high contrast" yellow filter (OG 515) that has a 78% day (photopic) transmission will only have 36% equivalent night (scotopic) transmission.[21] As the 50%-point of the yellow filters occurs more towards the blue end of the spectrum, the differences between the equivalent photopic and scotopic transmissions also narrow.

The cockpit lighting for Army aircraft has been converted from red to blue-green to provide compatibility with night vision image intensifiers. Since the yellow visors are blue blockers, the blue lighting and caution/warning segment lights are much dimmer through yellow filters. A caution to this effect was disseminated to the Army aviation community in Jun 95.[22]

Many commercial advertisements for yellow night driving glasses provide testimonies of improved visibility, less glare, better dark adaptation, etc. However, research on these yellow glasses fail to support these claims.[23,24]

Compliance with MIL-V-43511C Neutrality and Chromaticity.

The two yellow visors evaluated do not meet the clear visor requirements stated in MIL-V-43511C, Visors, flyer's helmet, polycarbonate.[25] We received a light colored yellow visor (approximately 470 nm) from an Army aviation unit in Alaskan in 1995 and conducted tests to determine if the yellow visor met the percent transmission, neutrality, and chromaticity specifications for Army helmet visors. The results showed that the 470 nm visor met the percent transmission requirements, but failed to meet the neutrality specification.

Conclusions

From the literature review, laboratory assessments, and observations of investigations, we cannot recommend using yellow visors for Army aviation, even though the majority of the aviators who have looked through yellow glasses or visors subjectively prefer the yellow filtered image over the nonspectrally tinted image. However, if there is a condition or situation where the yellow filter could improve detection or recognition, we believe that any full-color image capture system such as colored photographic film or videotapes can be used to show this effect. The full-colored image, whether a hard copy photograph or a colored monitor, can be viewed through the appropriate yellow or other spectral filter, and the visual perceptions will be very similar to the actual scene for any changes in contrast, resolution, or color. The Army aviation unit in Alaska that requested approval to procure yellow or high contrast amber visors has been challenged to photograph or videotape the conditions under which the yellow filter improves visual perception. We hope to have some image samples to compare this winter and possibly personally observe with and without yellow filters during flight operations over snow.

References

1. Luckiesh M. *Color and its applications*. New York: Van Nostrand; 1915.

2. Allen MJ. *A study of visual performance using ophthalmic filters*. Wright-Patterson AFB, OH: Aerospace Medical Laboratory; 1961. ASD Technical Report 61-576.

3. Dobbins DA, Kindick, CM. Jungle Vision V: *Evaluation of three types of lenses as aids to personnel detection in a semideciduous tropical forest*. Fort Clayton, CZ: U.S. Army Tropic Test Center; 1965. Research Report No. 5.

4. Kislin B, Miller JW, Martin BG, Dohrn RH. *The use of yellow lenses in Air Force oerations*. Brooks AFB, TX: USAF School of Aerospace Medicine; 1968. Report No. SAM-TR-68-93.

5. Richards W. *Colored filters as factors in improving human visual acuity*. Wright-Patterson AFB, OH: Aerospace Medical Research Laboratory; 1973. AMRL-TR-73-100.

6. Whitman RA. *Colored filters as factors in improving human visual acuity*. Wright-Patterson AFB, OH: Aerospace Medical Research Laboratory; 1973. Report No. AMRL-TR-73-100.

7. Kinney JS, Schlichting CL, Neri D, Kindness SW. *Various measures of the effectiveness of yellow goggles*. Groton, CT: Naval Submarine Medical Research Laboratory; 1980. Report No. 941.

8. Schlichting CL, Luria SM, Kinney JS, et al. *Aids for improving vision in white-out*. Groton, CT: Naval Submarine Medical Research Laboratory; 1980. Report Number 937.

9. Kinney JS, Luria SM. The perception of depth contours with yellow goggles. *Perception*. 1983;12: 363-366.

10. Luria SM, Wong J, Rodriquez R. *Cold weather goggles: effectiveness of yellow filter*. Groton, CT: Naval Submarine Medical Research Laboratory; 1983. Report No. 1011.

11. Provines WF, Rahe AJ, Block MG, et al. *Yellow ophthalmic filters in the visual acquisition of aircraft*. Brooks AFB, TX: USAF School of Aerospace Medicine; 1983. Report USAFSAM-TR-83-46.

12. Dees LK, Lyle LS. *A study of the effects of blue blocking filters on visual acuity*. Fort Rucker, AL: USAARL, Battelle Columbus Division; 1989.

13. Provines WF, Block MG, Tredici TJ. Yellow lens effects upon visual acquisition performance. *Aviat Space Environ Med*. 1992; 63: 561-564.

14. Thomas SR. Aircrew laser eye Protection: Visual consequences and mission performance. *Aviat Space Environ Med*. 1994; 65(5): A108-A115.

15. Rabin J, Wiley R. Differences in apparent contrast in yellow and white light. *Ophthalmic Physiol Opt*. 1996;16: 68-72.

16. Boff KR, Lincoln JE ed. *Engineering data compendium, human perception and performance*. Wright-Patterson AFB, OH: Aerospace Medical Research Laboratory; 1988:Vol. 1.

17. Eastman Kodak Company. *Kodak photographic filters handbook*. 1990.

18. Schott Glass Technologies, Inc. *Optical glass filters*. 1998.

19. McLean WE, Rash CE, Schmeisser ET. High contrast filters and their use in the aviation environment. Proceedings of the 37th SAFE Symposium, SAFE Association, Atlanta, Georgia; December 6-8, 1999.

20. Kelly SA, Goldberg S, Banton TA. Effect of yellow-tinted lenses on contrast sensitivity. *Am J Optom Physiol Opt*. 1984; 61: 657-662.

21. Richards OW. Do yellow glasses impair night driving vision? *Optom Wkly*. 1964; 55:17.

22. Licina JR, Vosine JJ. Amber visors: theirs-is-better misconception. *Flightfax*. June 1995.

23. Richards OW. *Yellow glasses fail to improve seeing at night driving illuminances*. Highway Research. *Abstracts*. 1953:23:32-36.

24. Davey JB, Seridan M. Night driving spectacles and night vision. *Optician*. 1953; 126:33-36.

25. Dept of Defense. *Visors, flyer's helmet, polycarbonate. MIL-V-43511C*. Washington, DC; July 16, 1990.

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Esthetic Periodontal Splint with Ribbond®

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Splinting of teeth is a procedure often performed by orthodontists, restorative dentists, and periodontists. Splints are utilized to stabilize teeth following orthodontic movement to prevent mobility during bone remodeling or tooth drifting as part of orthodontic relapse following active therapy. Splinting is also used as a part of occlusal therapy as a means of providing functional stability secondary to trauma from occlusion, and to stabilize a tooth or teeth after acute trauma. Finally splinting can be incorporated in a semi-permanent replacement for missing teeth such as incorporating a natural tooth pontic as a fixed partial denture (FPD). Many approaches to splinting involve wires, adhesives, and restorative materials (usually composite resins). This article will discuss the use of a plasma-treated polyethylene fiber. A case report will illustrate the use of Ribbond® Bondable Reinforcement Ribbon (RIBBOND, Seattle, Washington).

Introduction

A splint is defined as "any apparatus, appliance, or device employed to prevent movement or displacement of fractured or movable parts," whereas a dental splint is "an appliance designed to immobilize and stabilize loose teeth."[1] Though splinting is a commonly used technique, especially to stabilize periodontally involved teeth, its use for treating periodontal disease is controversial. Splinting of teeth is a procedure often performed by orthodontists, restorative dentists, and periodontists. Splinting is usually considered in the following situations: (1) to decrease mobility following acute trauma; (2) as part of occlusal therapy; (3) to prevent tooth drifting; (4) to provide functional stability; (5) for retention following orthodontics; (6) for the treatment of secondary trauma from occlusion; and (7) as a semi-permanent replacement for missing teeth such as incorporating a natural tooth pontic as a FPD.[2-4]

In general, the types of splints provided are classified as temporary, provisional, or permanent. Additionally, splints are subclassified as extracoronal or intracoronal. Permanent splints are intended to be used indefinitely and are often performed on teeth with reduced periodontium.[5]

Extracoronal splints do not involve any significant tooth preparation and can often be provided without any alteration in the external tooth structure. Extracoronal splints are usually reinforced with wire or mesh if additional strength is needed. Extracoronal splints can be utilized anywhere within the mouth, but are normally confined to anterior teeth.[5]

Indications for extracoronal splints are to provide stability in cases of acute trauma, maintenance of tooth position, to allow for healing of the periodontal ligament or remodeling of alveolar bone, and for comfort during function. Additional indications for extracoronal splints are anterior teeth with moderate mobility, endodontic-periodontic lesions, post-orthodontic retention (especially where retainer compliance is a concern), and for regenerative procedures where mobility may temporarily increase.[5]

Extracoronal splints hold several advantages of intracoronal splints. Extracoronal splints require less tooth preparation and usually less time for placement, thus are more conservative. Furthermore, extracoronal splints are more reversible. The disadvantages of extracoronal splints are an initial compromise in phonetics and comfort, plus they may limit the ability of the patient to perform effective home care.[5]

Various restorative materials have been utilized for splinting. Composite resin is the post popular material because it is easy to apply, is strong, possesses excellent esthetics, and is relatively simple to repair. The disadvantage of resin is its bond strength and the clinician must monitor periodically for breakage (which can allow teeth to migrate and caries to form). Acrylic resins can be used because of their excellent strength and esthetics. Because acrylic is more difficult to repair and stains more readily than composites, acrylic is usually reserved for temporary splinting. Amalgam has been used in the past for splinting, but is rarely considered now. Amalgam is subject to fracture and difficult to repair.[5]

In their review of clinical techniques for immediate provisional restorations, Hannon et al, stated the advantage of plasma-treated polyethylene fibers was the ability to connect unprepared abutment teeth with both strength and retention.[6] They felt bondable fibers contributed significantly to conventional bonding systems. Additionally, they stated an additional advantage of bondable fibers was their enhanced esthetics. Since the fibers are white, no masking was needed to achieve an esthetic result.

Case Presentation and Technique

A 37-year-old Caucasian female was referred to the periodontal department for evaluation and treatment. Her medical history was significant for tobacco abuse of one pack per day for the past 20 years. She did not wish to quit, even though smoking cessation was offered and the effects of tobacco on her periodontal health discussed. Her periodontal history was significant for both a mother and brother diagnosed with "gum disease." The patient had scaling and root planing provided approximately 2 years earlier, but had never seen a periodontist. Clinical examination revealed probing depths to 8 mm, generalized moderate bleeding upon probing, generalized mobility, yet a good level of home care.

Her treatment plan included initial therapy with antibiotics (Metronidazole), extraction of periodontally hopeless Nos. 14 and 16, and re-evaluation. Definitive treatment included periodontal surgery in the maxillary right sextant. The patient did complain of "looseness" of her mandibular anteriors (see Figure 1). She was informed periodontal prognosis was poor for Nos. 24 and 25 (mandibular central incisors). She did not wish to have any more teeth extracted. A compromised treatment plan included the use of a periodontal splint. She consented to the treatment plan and an esthetic splint was placed (see Figures 2 and 3). The patient was instructed on the use of floss threaders and proxabrushes for interdental cleaning under the periodontal splint. The patient was also informed that unless she stopped smoking and decreased her intake of coffee/tea, the splint would accumulate extrinsic stain. To date, the splint as been in place for 17 months. It has remained bonded, but has undergone significant staining. However, the splint has satisfied the patient's complaint of tooth mobility and meets her esthetic demands.



Fig 1. Pretreatment lingual view. Teeth Nos. 24 and 25 have grade 2 and 3 mobility, respectively.

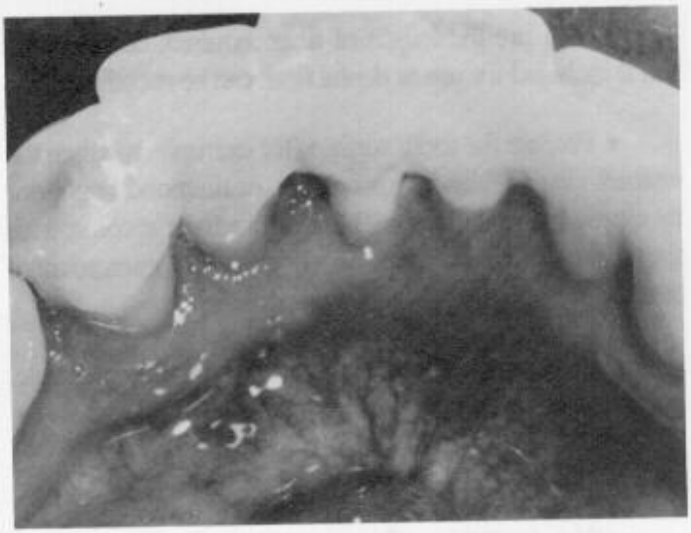


Fig 2. Lingual view Ribbond® utilized for a periodontal splint for mobile mandibular anterior.

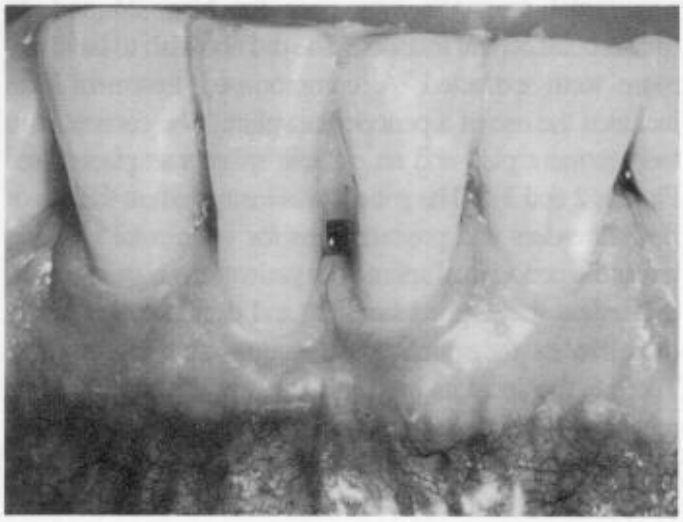


Fig 3. Facial view of Ribbond® which reveals good esthetics.

When purchased, Ribbond® provides the clinician with a booklet listing step-by-step instruction for the various uses of the material. The key when utilizing the polyethylene fiber is that one cannot handle the material until after it is wetted with an unfilled resin (bonding agent). The manufacturer states not to use one-step dentin primers or filled resins to wet Ribbond®. Finally, since the fiber does not polish well, it must be completely covered with resin, otherwise the patient will have a noticeably rough surface.[7]

For periodontal splints the following technique is recommended:[7]

- Measure the length of fiber required, dead-soft tin foil is included for use or dental floss can be substituted.
- Prepare the tooth surface (for example, roughen the enamel via sandblasting, prophyjet, or diamond burs prior to cleaning the surface). The manufacturer recommends the use of finishing strips to roughen the interproximal surfaces.
- Prepare the tooth surface to bond (for example, pumice, etch, and apply unfilled resin).
- Apply composite resin to the tooth surface.
- Wet the Ribbond® with a light coating of unfilled resin. Remember not to handle the fiber with gloves until it is wetted with unfilled resin.
- Adapt the Ribbond® to the teeth, being careful to tuck into all interproximal sites.
- Remove excess resin, shape resin, and then light cure.
- Apply a "smoothing" layer of flowable composite over the splint and then light cure.
- Check occlusion.
- Finish and polish splint.

The company recommends periodontal splinting be done on the lingual of mandibular anterior teeth, but the labials of maxillary anterior teeth, because these are the tensile sides. If periodontally splinting posterior teeth, this can be accomplished on the sides of the teeth. If there are existing amalgam restorations where splinting is desired, the manufacturer advises to cut a continuous groove in the center of the existing restorations in the segment that is to be splinted, follow a standard metal bonding technique, and then follow steps as listed above.[7]

Discussion

Ribbond® is a plasma-treated polyethylene fiber that has a cross-link lock-stitch leno weave for ease of control and adaptation. When the fiber is inserted, the links prevent the fiber from slipping and shifting. Since Ribbond® is not braided, it does not unravel when cut or fall apart when adapted to the teeth. Additionally, this plasma-treated polyethylene fiber is memory free. This allows for pliability and ease of conformation to the contours of teeth and the dental arch. The manufacturer claims that the weave of the Ribbond® fiber virtually eliminates memory and prevents the material from rebounding from the teeth once it is embedded in resin. This fiber is cold-gas, plasma-treated so that it will chemically bond to any dental composite or acrylic. The manufacturer states that Ribbond® will become an integral part of the prosthesis providing strength without bulk. The material is translucent and practically colorless, thus very esthetic. The modulus of elasticity of Ribbond® is 24.8 million psi (or 171 Gpa). It is so tough, the manufacturer includes special scissors to cut it. The tensile strength is 431,000 psi (or 3.0 Gpa). The elongation percentage is 2.8 with a water sorption of less than 1%. The standard size

of Ribbond[R] is 0.4 mm thick, thus a finished splint can be a thin as 0.75 mm.[7,8]

In order to test the strength of Ribbond[R], Ramos and co-workers studied the effects of plasma-treated polyethylene fiber's ability to increase the strength of polymethyl methacrylate in the laboratory.[9] Their findings suggested that clinically provisional FPD fractures could be reduced by incorporating Ribbond[R] in their fabrications. Samadzahel et al, determined that Ribbond[R] significantly increased the fracture load of reinforced resin-based restorations.[10] Fahl proposed a technique of multilayering composite resin as a buildup over an adhesively placed Ribbond[R] framework to restore missing maxillary lateral incisors.[11] This technique not only reinforced the restoration, but was both conservative and esthetic.

Though the value of splinting has been debated, most data is obtained from clinical observations rather than scientific studies. The dental professional should consider splinting to increase patient comfort and function. Splinting should be considered as a part of the overall treatment plan in cases of moderate-to-severe periodontal disease where tooth mobility is a concern. Ribbond[R] is a material that is easy to handle, requires minimal additional armamentarium and materials, and results in a stabile, esthetic splint. Ribbond[R] can be used for periodontal splints, orthodontic retainers, immediate replacement of avulsed or extracted teeth, dental emergencies, reinforcing composite restorations, endodontic post and cores, metal-free FPDs dentures, reinforcing components of over-dentures, reinforcing long-term, long-span provisional FPDs, and repair of broken dental protheses.[8]

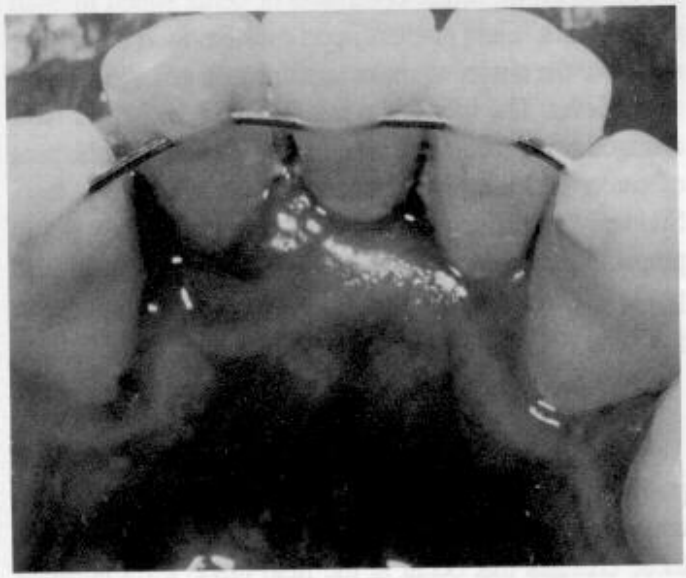


Fig 4. A more traditional wire bonded to mandibular anterior teeth. This splint is less esthetic than the Ribbond[R] material.

This case presentation illustrated the use of Ribbond[R] for an esthetic periodontal splint. Without this type of material, a more "traditional" type of bonded wire (see Figure 4) would have had to be utilized.

References

1. Glossary of Periodontal Terms. 3rd ed. The American Academy of Periodontology; 1992.

2. Lemmerman K. Rationale for stabilization. *J Periodontol.* 1976;47:405-411.

3. Strassler HE, Serio FG. Stabilization of the natural dentition in periodontal cases using adhesive restorative material. Periodontal Insights. 1997;4(3):4-10.

4 Breault LG, Fowler EB, Bruce WF. The reinforced natural tooth pontic: An esthetic alternative. *U. S. AMEDD J.* October-December 1998;34-38.

5. Nevins M, Mellonig JT. Periodontal Therapy Clinical Approaches and Evidence of Success. Carol Stream, Quintessence Publishing Co;1998:p 165-171.

6. Hannon SM, Breault LG, Kim AC. The immediate provisional restoration: A review of clinical techniques. *Quintessence Int.* 1998; 29:163-169.

7. Ribbond Application and Techniques (product booklet) by Rubo, DN. Edition 8. Ribbon, Inc;1992-1993.

8. Ribbond[R] Bondable Reinforcement Ribbon (product brochure), 1402 Third Ave, Suite 1030. Seattle WA 98101.

9. Ramos V, Runyan DA, Christensen LC. The effect of plasma-treated polyethylene fiber on the fracture strength of polymethyl methacrylate. *J Prosthet Dent.* 1996;76: 94-96.

10. Samadzahel A, Kugel G, Hurley E, Abaoushala A. Fracture strengths of provisional restorations reinforced with plasma-treated woven polyethylene fiber. *J Prosthet Dent.* 1997;78(5):447-450.

11. Fahl N. Restoration of the maxillary arch utilizing a composite resin buildup and a fiber framework. *Pract Periodontics Aesthet Dent.* 1998;10(3): 363-7.

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Mid-Career Officer Counseling

MAJ William C. Chambers, MS†

Career planning should begin with junior officer development. Later, mid-career officers should reevaluate their own career plans. Differences in company versus field grade activities compel self-evaluation directly after promotion to field grade officer. Self-appraisal should examine the best qualified path to staff or command assignments. Evaluations should clearly correlate with counseling. Likelihood to serve in corps immaterial command positions must be assessed.

Introduction

The Army Competitive Category divided classic career tracks from career tracks in Information Operations, Institutional Support, and Operations Support. The Army Medical Department has clear differences between corps. Differences continue within corps among each of the technical and professional specialties. Immaterial command billets have abolished some of the differences between corps and created new leadership opportunities. Career counseling and planning is vital to know yourself, your team, your situation, and to make sustained contributions. Development of immaterial commanders teamed with expert staff leadership requires detailed career planning.

Know Yourself

We must examine our lives. We must know ourselves to win battles. These are proven maxims. Yet there are countless examples of officers unprepared for promotion boards or who continue indifferently beyond their military obligations. How and why do we fail? More importantly, how can we achieve victory in our careers and at our profession?

A few senior leaders in prior decades made their junior officers write career plans. Their officers gained the benefit of deliberate mentorship before it was doctrine. The process of writing a realistic career plan made officers state goals with promotion timing, training requirements, and open self-assessment. This helped the senior leaders develop junior officers and understand their motivations. It was a great way to take care of soldiers.

After numerous schools, requisite leadership positions, and the consequences of prior assignments, field grade officers must reevaluate their own career plans. Genuine self-evaluation must confront whether an officer is best suited for senior command or better suited for staff assignments. Field grade officers must know if they desire and have the choice to make sustained contributions at the senior level. The world, the military, and the officer have changed since goals were set a decade earlier. But the pace of career and life divert attention from self-examination. Suddenly an officer may be unprepared after 15 years of preparation. Moreover, this is when many mid-career field grade officers must mentor junior officers into career planning and forthright self-assessment.

Activities differ between command and staff positions. These differences escalate after promotion from company grade officer to field grade officer. Considering those changes that occur at the field grade level is useful for career planning. The following table assists with the comparison of these activity differences in company and field grade billets.

	COMPANY GRADE	FIELD GRADE
Command	Accomplish the Mission Take Care of Soldiers Take Care of Equipment Set the Example as Role Model Tactical/Operational Proficiency	Visualize the Mission Development of Leaders Stewardship of Resources Exemplar of Values and the Unit Operational/Strategic Proficiency
Staff	Technical Proficiency Administration and Management Teamwork and Coordination Implement Systems and Doctrine Direct Support of the Commander	Technical Planner and Developer Anticipation of Consequences Building and Integrating Teams Design Systems and Doctrine General Support to Commanders

Table. Commander and Staff Activities in Company and Field Grade Billets

Field grade billets that integrate command and staff activities are rare. Chiefs of Staff or Deputy Commanders plainly integrate command and staff action. Field grade Executive Officers understand and execute the office of command, but the privilege of command is separate, even from acting command. Board selected command billets are a distinct position of extraordinary trust, privilege, and authority. Command activities are unique. Different activities evolve between company grade and field grade officers. A dramatic metamorphosis occurs at the activity level of field grade board selected commanders.

Know Your Team

Field Manual 22-100, Army Leadership, was recently published in Aug 99. It now consists of counseling and senior leadership in one publication. It deftly spans a gamut of modern leadership science from a bedrock of proven leadership fundamentals. The integration of counseling with evaluation requires understanding activities specifically related to command and staff positions. Mid-career counseling is essential to motivate, develop, and evaluate the performance of a field grade officer. Similarly, this resets the standard for field grade officers to start career counseling their company grade officers.

Likewise, evaluation of performance must be based on goals related to solid distinctions of command in contrast to staff activities. Potential to excel in board selected command billets is exceptional; the opportunity for such command is strikingly sparse. Field grade officers are acculturated to strive for command. They accept staff jobs as second-class alternatives to command. In fact, supplies of officers with potential to excel in command far exceed demand. Yet, evaluation of potential relegates technical staff leadership into the same group as command tracked field grade officers. The forced Center of Mass rating system drives aggregation of rated populations at command levels. The affinity is to designate potential commanders with Above Center of Mass evaluations. As a result, an excess supply of field grade officers with command potential get promoted who may not be "best qualified" for staff leadership positions requiring advanced technical skills.

Realistic mid-career counseling should develop officers according to their performance of activities related to command versus staff positions. The demand the military has for advanced technical skills and staff leadership must be recognized, developed, and then evaluated for potential according to supply and demand career opportunity trends. The integration of performance counseling with evaluation at the mid-career point is crucial.

Know Your Situation

The military alters about every 4 years. The senior leadership changes with election of our Commander in Chief. This is not just evolution; there is redirection. Additionally, technology changes the nature of war. Culture changes the nature of soldiers that join the military. Adversaries change, too, as does the doctrine that brings the profession along with the changes in state, leadership, technology, culture, and opponent. Career planning and counseling unites an officer's skills, needs of the team, and the situation. Adaptation requires integrated career thinking

where officers know their selves, teams, and situations. Mid-career is the center of gravity for blunt senior leader counseling.

Sustained Contribution

There is a point of diminishing returns in every career; this is a two-way process. There is a point where there is less to give to the military for myriad reasons. Most obvious is decreasing need for numbers of officers at each higher rank, whether command or staff. Decreased structure has exacerbated this process but the hierarchical nature of military organizations has always required fewer Colonels than Captains. Similarly, the point is reached where the military offers less development, assignments, and promotions.

Senior selfless service is made real when officers know they give more to the military than can be received back from the military. Sustained contribution is stewardship of the future. Field grade officers pass the guidon to junior officers via career counseling. Development of future commanders and staff leaders has greater impact than direct contribution. This is the heart of sustained contribution. Benefits may reinforce senior leader motivation, but beyond rewards or reinforcements, the military value system requires authentic career counseling proved valid by evaluations. This is a vital component of the "Be, Know, Do" process at the senior officer level. This integrated way of counseling and evaluating to meet the future demands of the military force structure is how we can achieve victory in our careers and at our profession.

Conclusion

The AMEDD has transitioned to corps immaterial command selection boards. Best qualified leaders will be competitively selected. Successful leadership of AMEDD organizations will depend on the best qualified senior staff working as a balanced and integrated command group. Deliberate planning is required to grow champion command teams. Counseling, evaluation, and promotions must develop senior officers to fill the demands of future force structure requirements in the AMEDD.

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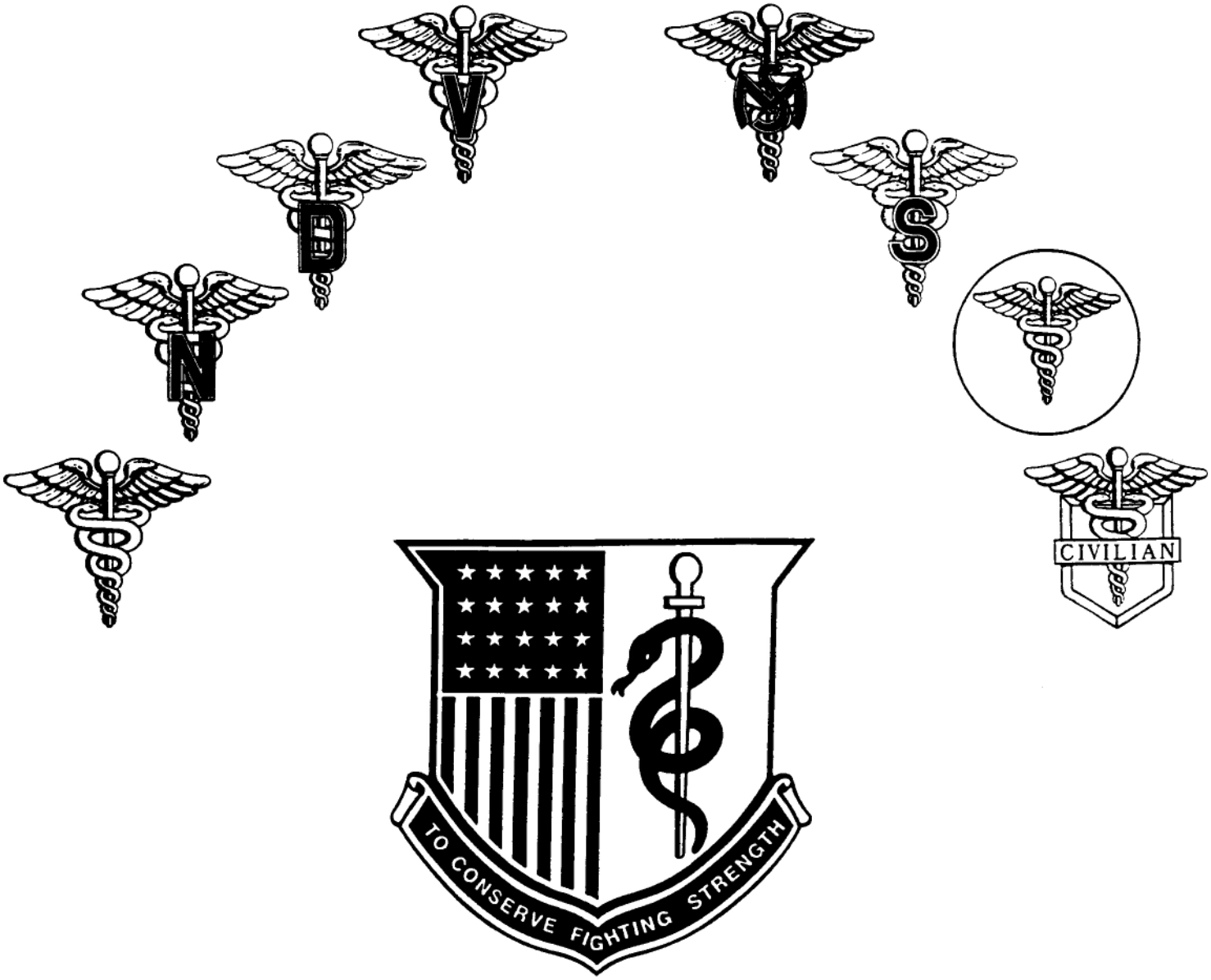
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